



INDIAN AGRICULTURAL  
RESEARCH INSTITUTE, NEW DELHI





UNITED STATES DEPARTMENT OF AGRICULTURE  
AGRICULTURAL RESEARCH ADMINISTRATION  
OFFICE OF EXPERIMENT STATIONS

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# EXPERIMENT STATION RECORD

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## RECENT WORK IN AGRICULTURAL SCIENCE<sup>1</sup>

### AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Report of the Chief of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, 1944, O. E. MAY (*U. S. Dept. Agr., Bur. Agr. and Indus. Chem. Rpt.*, 1944, pp. 39; also in *U. S. Dept. Agr., Agr. Res. Admin.*, 1944, pp. 13-51).—The following, among other accomplishments, are reported upon by the Bureau and the U. S. D. A. Regional Research Laboratories: Establishment of industrial penicillin production; testing of antibiotics for toxicity to animals; survival of an allergenic component of castor-beans after cooking; development of oil-soluble nicotine compounds; further advances in food dehydration; improvement of quality of dried eggs through microbiological studies; "Velva Fruit," a high-quality frozen-fruit dessert as a commercial outlet for surplus cantaloups and other fruits; citrus juice concentrates; use of grapefruit pectin-pomace commercially; a table sirup from apple juice; tartrates recovered from grape wastes by new process; nightshade berries removed from canning peas by new process; leaf meals from vegetable wastes and sweetpotato silage as feeds; synthetic rubber program helped by improvement of tallow emulsifiers; recovery of rubber from domestic plants; cotton tire cords improved by "dual-stretch" process; new cotton bandage fabric welcomed by hospitals; flameproofing of cotton fabrics; industrial utilization of sweetpotatoes; wheat starch from flour by new process; means for changing uncooked starches to sugars; grain-to-butylene glycol-to-butadiene process ready for industrial use; new starch compound useful in coatings and laminating plastics; crude lactic acid converted to pure derivatives; cocoa-butter and olive-oil substitutes made from cottonseed and peanut oils; good cold glue from peanut protein; globular proteins converted to fibrous form; waterproof glue for plywood from soybean meal and phenolic resin; industrial use of Norelac resin from soybean oil; ground corncobs used for cleaning airplane engines; Noreseal as a cork substitute; turpentine derivatives useful for synthetic rubber; use of Bureau's gum-cleaning process by naval stores industry; chemical stimulation of trees without damage to pine gum; and new domestic sources of tannins.

Inorganic chemistry, F. EPRAIM, edited by P. C. L. THORNE and E. R. ROBERTS (Edinburgh: Oliver & Boyd; New York: Nordeman Pub. Co., 1943, 4. eng. ed., rev., pp. 921+, illus. 95).—This book is designed to include an unusually

<sup>1</sup> The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

large quantity of information in a highly concentrated form "and yet to present it in a palatable form." The layout of the book differs considerably from that of the usual text, therefore, and especially in that "the materials of inorganic chemistry are dealt with collectively rather than individually, with a consequent saving of space and of fatigue to the reader." In some degree the departures from the usual plan are to be seen even in the titles of sections and chapters, which are as follows: Section 1, Elements, contains chapters on the structure of matter; properties of elements—the periodic system; radioactive elements and isotopes; modifications of elements, general and special; and preparation of elements, nonmetals and metals. Section 2, Halogen Compounds, takes up: Hydrogen compounds of the halogens; halogen salts, general, univalent metals; halogen salts—bi- and tervalent metals; the coordination theory and the ammines; halides of quadri-, quinque- and sexavalent metals; and oxygen compounds of the halogens. Section 3 deals, under the caption Oxides of Hydrogen and of the Metals, with water and hydrogen peroxide; oxides of the alkali and alkaline earth metals—the rare earths; basic oxides of the heavy metals; and metallic oxides, acidic. Section 4, The Compounds of Sulphur, Selenium, and Tellurium, contains the three chapters: Hydrogen compounds of sulfur, selenium, and tellurium; oxygen compounds of sulfur, selenium, and tellurium; and oxygen compounds of sulfur, selenium, and tellurium—halogen compounds. In Section 5, The Nitrogen, Phosphorus, Arsenic Group, are chapters dealing with the hydrides of the elements of the fifth group; oxygen compounds of nitrogen; oxygen compounds of phosphorus, arsenic, antimony, and bismuth; and sulfur and halogen compounds of the elements of the fifth group. Section 6 covers The Elements of the Fourth Group and Boron, under the following titles: Hydrides and halides of the elements of the fourth group—oxides of carbon; oxides of the elements of the fourth group—sulfides; and carbides, silicides, and borides—intermetallic compounds. An appendix to the text has the title, The Literature of Inorganic Chemistry, and there are further appended the tables of atomic weights and atomic numbers, of the periodic classification, and of crystal structure. A subject index concludes the work.

**Soil and plant material analyses by rapid chemical methods, IV (Hawaii Planters' Rec. [Hawaii Sugar Planters' Sta.] 48 (1944), No. 3, pp. 213-230, illus. 1; also Hawaii. Sugar Planters' Sta., Agr. and Chem. Bul. 54 (1944), pp. 213-230, illus. 1).**—This paper presents an adaptation of the Clements system of analysis for use as a part of the station's system of rapid chemical methods, described in previous papers of this series (E. S. R., 87, p. 174; 90, p. 602).

**Colorimetric determination of traces of metals, E. B. SANDELL (New York: Interscience Pubs., 1944, pp. 487+, illus. 73).**—The author here presents a collection of modern methods in this field of analysis. His purpose was selective rather than encyclopedic. He points out, however, that "no one reagent is necessarily the best for the determination of an element in all kinds of samples or under all conditions, and consequently two or three methods are sometimes described in greater or less detail for a number of the metals." It is further noted that "the effect of foreign elements on a particular color reaction is frequently poorly known and the prevention of the interference of foreign substances has, for the most part, been incompletely studied. Methods for the separation of traces are but poorly developed or even nonexistent for many elements. The user of this book is likely to find many of his questions in this phase of trace analysis unanswered in the present treatment."

The book is divided into a general part, of which the four chapters deal respectively with trace analysis, methods for the separation and isolation of traces of substances, colorimetry and spectrophotometry in trace analysis, and general

colorimetric reagents; and a special part in which, after a brief introduction concerned with the plan of treatment, chapters are devoted to the determination of each of the following elements: Aluminum, antimony, arsenic, barium, beryllium, bismuth, cadmium, calcium, cerium, chromium, cobalt, columbium and tantalum, copper, gallium, germanium, gold, indium, iridium, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, osmium, palladium, platinum, potassium, the rare earth elements, rhenium, rhodium, ruthenium, scandium, silver, sodium, thallium, tin, titanium, tungsten, uranium, vanadium, zinc, and zirconium.

Iodometric and colorimetric methods for the estimation of calcium in serum based on the use of an improved permanganate solution, J. A. DE LOUREIRO and G. J. JANZ (*Biochem. Jour.*, 38 (1944), No. 1, pp. 16-19, illus. 1).—The modified standard permanganate solution was prepared by dissolving 3.5 gm.  $KMnO_4$  in 1 l. of stock diluent, which was a solution containing 35 percent  $H_2SO_4$  plus 5 percent  $MnSO_4 \cdot 4H_2O$ . Convenient dilutions of the standard solution were made with the stock diluent. The modified  $KMnO_4$  solution was found to react stoichiometrically with oxalic acid and potassium iodide at room temperature; by its use, therefore, the usual titration to the uncertain pink end-point could be replaced by the more exact and sensitive iodometric estimation of unreduced permanganate through the iodide-thiosulfate reaction or colorimetrically by means of a photoelectric colorimeter, since the color of this permanganate solution follows Beer's law. Results by the colorimetric and iodometric titration procedures in the estimation of calcium in serum were found to be in agreement. Application of the method to 2-cc. samples of serum is described and the agreement with the results of the Clark-Collip method verified. Examination of the experimental errors showed that while in the Clark and Collip method the errors of titration exceeded those involved in the isolation of the calcium oxalate precipitate from the 2 cc. of serum, the reverse was the case with the new method. This made possible its adaptation to smaller amounts of serum.

Inhibition of the succinoxidase system by cysteine and cystine, S. R. AMES and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Arch. Biochem.*, 5 (1944), No. 2, pp. 191-205, illus. 6).—The effect of cysteine in inhibiting the succinoxidase system in mouse-tissue homogenates was found to be influenced by the length of time the homogenate was incubated before adding the inhibitor, and upon the concentration of the inhibitor and its time of contact with the enzyme. To obtain reproducible results, it was necessary, therefore, to control these conditions. In addition, it was necessary to control the concentration of four-carbon dicarboxylic acids present, since prior addition of very small concentrations of malate and fumarate were found to protect the enzyme against the action of the inhibitor. Incubation of the homogenate with a solution of cozymase before adding the inhibitor increased the extent of the inhibition; in the presence of calcium ions, the change of inhibition values on further incubation was prolonged, thus favoring reproducibility of results. "All this evidence is in support of the hypothesis that the extent of inhibition is dependent on the concentration of four-carbon dicarboxylic acids, specifically fumarate and malate, in the homogenate. These compounds are destroyed on incubation through a cozymase-linked enzyme system, which is itself destroyed on incubation with calcium ions. Therefore incubation with calcium ions results in a constant concentration of malate and fumarate, and reproducible inhibition values can be obtained. The above hypothesis has been used to speculate further on the reactions and equilibria involved in this complex enzyme mechanism."

The official methods used for assessing quality in Canadian dried whole egg powders ([n. p.]: *Canada Spec. Prod. Bd.*, 1944, pp. 10-+).—These methods, prepared by the Canadian National Research Council and the Science Service of the Department of Agriculture, are described, and include the following tests: Mois-

ture and volatile material content, potassium chloride values, fluorescence measurements, palatability ratings, pH value, and bacterial counts.

The "cyclization" of vitamin A and allied compounds, E. G. E. HAWKINS and R. F. HUNTER (*Biochem. Jour.*, 38 (1944), No. 1, pp. 34-37).—"β-Apo-2-carotenol, β-apo-2-carotenol, axerophthylideneacetone, the C<sub>20</sub> aldehyde obtained by oxidation of vitamin-A alcohol, and the alcohol obtained by Pondorff reduction of the latter, all fail to undergo cyclization on treatment with alcoholic HCl, whereas axerophthylideneisopropyl alcohol gives a compound which shows the characteristic fine structure of a cyclized product in the ultra-violet region. The bearing of these and other observations on the structure of cyclized vitamin A, vitamin A<sub>2</sub>, and subvitamin A is discussed."

Photochemical reaction of iodine with carotenoids, F. P. ZSCHEILE, R. H. HARPER, and H. A. NASH. (Ind. Expt. Sta.). (*Arch. Biochem.*, 5 (1944), No. 2, pp. 211-220, illus. 5).—"The photochemical action of iodine on α- and β-carotenes in solution was studied in relation to several factors. The photochemical threshold occurs in the spectral region above 7000 a. u. At low values, illumination may limit the rate of absorption decrease. The effective radiation is that absorbed by iodine rather than by carotene. The photochemical action of iodine on the hydrocarbon solvent (or impurity) may be the cause of spurious results because it effectively removes iodine from catalytic influence on carotene. Cyclohexane and iso-octane are better solvents than hexane for studies of isomerization because iodine disappears from them much more slowly. Spectroscopic observations were used to follow the course of the reaction. An initial rapid decrease of absorption at 4720 a. u. for α-carotene, largely due to isomerization, is followed by a much slower decrease, which may, under some conditions, involve gross destruction of the carotene. The absolute concentration of iodine is more significant in determining the fractional change of absorption than is the carotenoid-to-iodine ratio of concentrations. It is concluded that although an equilibrium mixture of carotenoid stereoisomers may be formed catalytically through the photochemical action of iodine, further complications arise from an irreversible photochemical reaction of iodine with carotene; the over-all mixture is thus very complex. The use of such mixtures as an aid in quantitative spectroscopic analysis of plant extracts is not very promising."

Chemical estimation of vitamin B<sub>6</sub> in foodstuffs, A. C. BORTONLEY (*Biochem. Jour.*, 38 (1944), No. 1, p. V).—This brief summary indicates that the method of Bina, Thomas, and Brown (E. S. R., 90, p. 441), involving adsorption on Superfiltrol and elution with 0.5 percent alcoholic NaOH, was very satisfactory for extracting vitamin B<sub>6</sub> from test material and removing interfering substances. With products of high fat content, the extraction procedure was modified by interpolating an extraction with ether between the first centrifuging and the neutralization of the acid extract. Assay by the diazo reaction of Bina et al. was found to give high results. Better agreement with rat assay values was obtained by acidifying the alcoholic eluate (pH 5-6) with dilute acetic acid, distilling off the alcohol, dissolving the residue in water, and using aliquots of this for assay by the method of Bird et al. (E. S. R., 87, p. 762), involving adsorption on Superfiltrol and simultaneous elution and color development with 2,6-dichloroquinonechloroimide in butyl alcohol. A parallel estimation was carried out using the same quantity of test material with added vitamin B<sub>6</sub>. From the photometric readings of the two solutions, the vitamin content of the material was obtained with automatic correction for incomplete recovery. Analyses by this method in comparison with the results of biological tests on rats by the method of Coping (E. S. R., 91, p. 365) gave the following values: Dried brewers' yeast 33.6 µg. and 29.9 µg., respectively; wheat germ 17.5 µg. and 13.5 µg.; spray-dried skim milk 4.1 µg. and 3.8 µg.;

dried national wheat meal bread 2.0  $\mu\text{g}$ . and 2.1  $\mu\text{g}$ .; dried potato 9.0  $\mu\text{g}$ . and 9.2  $\mu\text{g}$ .; and a dried mixed diet 2.2  $\mu\text{g}$ . and 2.5  $\mu\text{g}$ . per gram.

Determination of biotin with *Lactobacillus arabinosus*, L. D. WRIGHT and H. R. SKEGGS (*Soc. Expt. Biol. and Med. Proc.*, 56 (1944), No. 2, pp. 95-98, illus 1).—*L. arabinosus* offered several advantages as a test organism, since its growth requirements are less complex than those of *L. casei*, since it responds to relatively few extraneous growth stimulants, since desthiobiotin does not affect its growth, and since it does not respond, as *L. casei* was found to do, to certain water-soluble, avidin-combinable forms of biotin present in certain enzymatically prepared materials such as yeast extract, proteose peptone, and trypsinized vitamin-free casein. When these materials were autoclaved with 6 N  $\text{H}_2\text{SO}_4$  prior to determination of the biotin content, comparable results were obtained with the *L. arabinosus* method and with the method of Landy and Dicken (E. S. R., 90, p. 298), using *L. casei*. In the procedure developed for the assay, 5 cc. portions of the complete medium (consisting of certain purified amino acids, glucose, purines and pyrimidines, inorganic salts, and several synthetic members of the vitamin B complex) are added to graded amounts of the biotin standard and of the test material and autoclaved in plugged test tubes, cooled, and seeded aseptically with the bacterial suspension for inoculation. After a 72-hr. incubation period the growth response of the organism is estimated by titration of the lactic acid produced, using bromthymol blue as the indicator. The acid production in response to the unknown is read against the curve showing the acid production in similar assay tubes containing graded amounts of biotin.

Factors affecting the determination of biotin by means of *Lactobacillus casei*, F. F. TOMLINSON and W. H. PETERSON. (*Wis. Expt. Sta.*). (*Arch. Biochem.*, 5 (1944), No. pp. 221-231).—Changes in the basal media of Shull et al. (E. S. R., 87, p. 626), in the method of sterilization, and in inocula produced no significant effects on the behavior of *L. casei*. In the utilization of the biotin methyl ester, a pH of 6.8 was more favorable than a pH of 5.6. High levels of the ester gave a greater percentage activity than low levels, and longer incubation periods increased percentage activity, although complete utilization of the methyl ester at low levels was not reached. Under the various conditions studied, the activity of the methyl ester ranged from 0 to 100 percent, indicating the necessity of using the biotin free acid rather than the methyl ester in assays with *L. casei*. Variations in the casein hydrolyzate of the medium caused variations in the steepness of standard curves. Copper salts in low concentration inhibited acid production, and replacement of yeast filtrate by vitamin B<sub>6</sub> resulted in a lag in acid production in 3-day incubations. A synthetic medium containing pure amino acids and pure growth factor was considered to be less satisfactory for assay purposes than one containing casein hydrolyzate and yeast filtrate. The pure amino acids were too costly for routine use and the pure growth factor was not so desirable as the yeast filtrate, because the latter appeared to contain unknown substances that were slightly stimulatory. Similar stimulatory substances may be contained in the sample under assay, and their effect can be obviated by inclusion of yeast filtrate in the basal medium.

The laboratory diagnosis of nicotinic acid deficiency: An improved procedure for the determination of F<sub>2</sub> (N-methyl nicotinamide derivative) in urine, V. A. NAJJAR (*Bul. Johns Hopkins Hosp.*, 74 (1944), No. 6, pp. 392-399, illus 1).—The method described represents a modification of the original Najjar-Wood procedure (E. S. R., 85, p. 702) for the estimation of the fluorescent factor F<sub>2</sub> (an N-methyl nicotinamide derivative) in urine. The steps in the modified method involve treatment with adsorbent charcoal, adsorption on permutit, elution with KC1, alkalization of the eluate, extraction with butyl alcohol, and measurement

of the fluorescence of the butyl alcohol extract. Interfering urinary pigments, the fluorescent substance  $F_1$ ,<sup>2</sup> and thiamine and riboflavin are removed by the preliminary charcoal adsorption, thus increasing the sensitivity and accuracy of the test. In determinations made with a fluorocomparator the butyl alcohol extract is matched against standards prepared from known concentrations of N-methyl nicotinamide chloride. If the fluorophotometer is used, the instrument is standardized in terms of N-methyl nicotinamide chloride rather than in terms of arbitrary quinine units. However, the amide derivative need not be used for standardization each time the instrument is used, since the more convenient quinine standard can be used once the quinine equivalent has been determined for a standard solution of N-methyl nicotinamide chloride with a particular optical system.

Application of the test in diagnosis of nicotinic acid deficiency indicated that casual urine specimens are more useful than those obtained after fasting in diagnosing such deficiency, since fever, starvation, and other conditions accompanied by acute wasting tend to cause a temporary increase in  $F_2$  output. For determining various grades of nicotinic acid deficiency, load tests in which nicotinamide is given either orally or parenterally are used. In oral load tests, normal adults given 100 mg. nicotinamide excreted between 2,100 $\gamma$  and 4,000 $\gamma$  N-methyl nicotinamide chloride in 4 hr.

On the isolation and properties of the fluorescent factor  $F_2$  from human urine, V. A. NAJJAR, V. WHITE, and D. B. McN. SCOTT (*Bul. Johns Hopkins Hosp.*, 74 (1944), No. 6, pp. 378-391, illus. 3).—The bluish fluorescent substance  $F_2$ , present in the urine when the body is adequately supplied with nicotinic acid, was isolated from the urine from subjects who ingested 0.5 gm. nicotinamide. The isolation and purification procedure, described in detail, involved the following steps: (1) Preliminary extraction of the urine with adsorbent charcoal to remove extraneous pigments and other materials; (2) adsorption of  $F_2$  on permutit; (3) elution with cold saturated barium chloride; (4) extraction of  $F_2$  from the eluate (made alkaline with saturated barium hydroxide) with isobutyl alcohol; (5) precipitation of the  $F_2$  by treatment of the extract with a large excess of ether; and (6) subsequent crystallization from various solvents. The alkalinization and butanol extraction served to convert the faintly fluorescent precursor substance in the urine to the highly fluorescent  $F_2$  compound. The stability of the compound and its behavior toward a number of reagents were investigated. Attempts to identify the urinary precursor and the  $F_2$  compound, by comparison of their behavior with that of known substances, indicated that the former is mostly N-methyl nicotinamide  $\alpha$ -carbinol and the  $F_2$  apparently a butyl ether of N-methyl nicotinamide  $\alpha$ -carbinol.

Effect of various lighting conditions on riboflavin solutions, L. J. DEMERRE and W. S. BROWN (*Arch. Biochem.*, 5 (1944), No. 2, pp. 181-190, illus. 9).—The investigation was limited to solutions of 8  $\mu$ g. of riboflavin per cubic centimeter in distilled water and in a mixture of n-butyl alcohol, pyridine, and acetic acid; three series of assays were made in the aqueous medium at pH 3.7, 6.3, and 9.0, respectively. The solutions were exposed for periods of 0, 5, 15, 30, 60, and 120 min. to the radiation under study, all samples being stored in the dark and measured fluorometrically (with the Klett fluorometer, employing the null point method) as soon as the last sample had been withdrawn. A standard curve was run with each series of experiments, standard solutions of quinine being used to confirm the reliability of the readings, and the curves being established by plotting amounts of destruction of riboflavin in micrograms per 0.5 cc. against time. The aqueous solutions were subjected to exposure to (1) monochromatic light of various wave lengths, using the filament lamp of the Coleman spectrophotometer; (2) natural light at intensities (expressed in Weston units) equivalent to diffused daylight,

<sup>2</sup>Science, 93 (1941), No. 2401, pp. 20-21.

shade, and bright sunlight; (3) artificial light from a 150-w., reflector-type, filament lamp at distances of 30, 50, and 100 cm.; (4) colored light obtained with the above reflector in conjunction with colored cellophane filters; and (5) ultraviolet light (mercury-vapor lamp). The solutions in the butyl alcohol mixture were exposed to sunlight, diffused daylight, artificial light, and ultraviolet light.

The results, presented chiefly in the form of curves, showed that the riboflavin in aqueous solution suffered no destruction in the light from the filament lamp through the region of the spectrum ranging from red to violet; considerable destruction in direct sunlight, even for a brief period of time; but no destruction in diffused daylight of intensity not higher than 6 Weston units. Manipulations necessary for the extraction of riboflavin from foods and biological fluids can, therefore, be made safely in diffused daylight. In artificial light, the aqueous solutions at pH 3-4 were quite stable at a minimum distance of 1 m. for 2 hr.; quantitative riboflavin determinations at this pH could, therefore, be carried out under ordinary lighting conditions. Near neutrality, however, the riboflavin solutions exhibited slight instability at 1 m. from the 150-w. reflector lamp used. The reflector screened with a red cellophane filter did not adversely effect the aqueous acid riboflavin solutions and provided adequate illumination for laboratory operations. Solutions of riboflavin in the butyl alcohol mixture were relatively unstable under the conditions used, indicating that quantitative determinations in this medium should be carried out at a light intensity not greater than 6 Weston units. The ultraviolet light, in all tests, destroyed the riboflavin very rapidly.

**A rapid method for the determination of thiamine in wheat and flour, A. HOFFER, A. W. ALCOCK, and W. F. GEDDES.** (Minn. Expt. Sta.). (*Cereal Chem.*, 20 (1943), No. 6, pp. 717-729).—The rapid method developed for use in flour mill control, and here described in detail, was a modification of the simplified method of Andrews and Nordgren (E. S. R., 87, p. 9), and involved (1) extraction of a 1-gm. sample (containing 3-5 µg. thiamine) with 20 cc. of 25-percent KCl (in 2-percent acetic acid) by heating the mixture in a water bath at 70° C. for 30 min.; (2) treatment of 5 cc. of the supernatant solution, obtained by centrifuging, with 3 cc. of the oxidizing agent, which contained 0.9 mg. of ferricyanide and was freshly prepared each day by diluting 1 cc. of 3-percent potassium ferricyanide solution to 100 cc. with 15 percent NaOH; (3) extraction (after 1 min. reaction time) with 16 cc. isobutanol, by shaking for 1½ min.; (4) separation of the isobutanol layer, by centrifuging, and drying with anhydrous sodium sulfate; and (5) determination of fluorescence of the isobutanol extract. Adjustment of the fluorophotometer against quinine sulfate, standardization with pure thiamine, and the blank determinations were carried out as in the regular thiochrome procedure.

"With unenriched commercial flours the rapid method gave low results, but by the use of a correction factor the values were brought into a close agreement with those obtained by the regular method. With enriched flours and wheat no correction was required. With bran and shorts the rapid method gave higher thiamine values than the regular procedure; with germ it gave lower values. The presence of cocarboxylase is mainly responsible for the low results with germ, but no explanation has been found for the high results on bran and shorts or for the low results on unenriched flours. Replicate error was slightly lower for the rapid than for the regular method. For both methods, the absolute errors increased with increasing thiamine content."

**The experimental error of the thiochrome method for thiamine assay, F. C. HILDEBRAND and W. F. GEDDES.** (Minn. Expt. Sta.). (*Cereal Chem.*, 20 (1943), No. 6, pp. 714-717).—Data consisting of (1) duplicate values for 68 samples of wheat, rye, and wheat and rye flours obtained by the same analytical method in five different laboratories, and (2) duplicate values for 514 samples of wheat

kernels, glumes, and stems, determined by the same analytical method in a sixth laboratory, were subjected to statistical analysis. This analysis showed that absolute errors of the thiochrome method increased with increasing thiamine content, but not in strict proportion. Such errors tended to be largest, on a percentage basis, with low thiamine samples and to diminish with increasing thiamine content. "At the thiamine level for enriched flour, the means for duplicate analyses must differ by more than 0.1 mg./lb. to be significant where the analyses are made in one laboratory, and by more than 0.2 mg./lb. where the analyses are made in different laboratories."

The reduction of dehydroascorbic acid in plant extracts, E. M. Crook and E. J. Morgan (*Biochem. Jour.*, 38 (1944), No. 1, pp. 10-15, illus. 3).—The rate of reduction of dehydroascorbic acid by reduced glutathione was tested in a buffered solution in the presence and absence of various plant extracts obtained by grinding the plant material, pressing it out through cloth, and centrifuging. Thirty species of plants were examined for the presence of the enzyme catalyzing the reduction of dehydroascorbic acid by reduced glutathione. The enzyme was absent in the juice of eight species, including sugar beet (roots and leaves), white mustard (seed), hydrangea (leaves and stalks), celery (stalks), carrot (roots), ripe tomato, lettuce (leaves), and dandelion (leaves). Addition of the juice from nine species at least doubled the rate of reduction of dehydroascorbic acid caused by reduced glutathione alone without added enzyme. These nine species included barley (grain extract), wheat (sprouted grain extract), cauliflower, cabbage, turnips (tops), broad beans, alfalfa, potatoes, and peas. The most active species were cauliflower and broad beans, in both of which glutathione protected ascorbic acid from oxidation by atmospheric oxygen. The physiological role of the enzyme is described.

The dehydroascorbic acid for these tests was prepared by an unpublished method of E. L. Hirst, which is here described, and involved the following steps: Treatment of ascorbic acid dissolved in excess absolute ethanol with two equivalents of alcoholic I<sub>2</sub>; the addition of pure PbCO<sub>3</sub> stirred in until all the I<sub>2</sub> reacted with the ascorbic acid and the HI had been removed by the PbCO<sub>3</sub>; evaporation of the neutral solution to dryness at 30° C. under a pressure of 12 mm., followed by extraction of the product with absolute ethanol; and evaporation of the filtered alcoholic solution to give a slightly yellow frothy solid containing 65-75 percent dehydroascorbic acid, about 25 percent other organic material, and about 10 percent ethanol. The product was stable for at least 3 mo. in a desiccator.

Problems in freezing foods, D. K. Tressler (*Agr. Engin.*, 26 (1945), No. 1, pp. 13-14, illus. 1).—The author believes that locker and home-cabinet freezing will continue to be a popular preservation process, but holds some changes or extensions of methods to be desirable and in some instances necessary.

With reference to meat freezing, the author notes that many persons do not care to butcher their own animals and that very few homes have coolers of the right size and temperature to be suitable for the chilling and aging of freshly slaughtered carcasses. Even though freezing cabinets become very common, still there will be much need for complete service locker plants to provide butchering, chilling, meat cutting, and packaging service. Concerning packaging materials for meats, he notes that little of the waxed paper on the market is sufficiently moisture- and vapor-proof to be satisfactory. Further, waxed paper will permit the transfer of odors. Specially coated moisture-proof vegetable parchment papers and moisture-proof cellophanes are among wrapping materials which the author finds very satisfactory for meats. Maintenance of a temperature of 0° F. or lower is necessary to prevent atmospheric oxidation (rancidification) of the meat. For poultry, 0° will be satisfactory for from 6 to 8 mo., but if storage is to be for a longer period a temperature of -10° should be maintained.

Difficulties in the freezing of dairy products are noted in less detail, as are also problems presented by the preparation and freezing of vegetables and fruits.

[Sugar yield and production, maple trees] (*Vermont Sta. Bul. 520 (1944)*, pp 16-17, illus. 1).—Records of the sweetness of sap at the spout were obtained from 3,418 trees in 9 sugar lots of differing ages, exposures, and spacings. Approximately 2,250 of the trees were visited three or more times. Most of the others were tested twice. Experiments to determine the effects of thinning and the application of commercial fertilizer on the percentage of sugar in the sap were begun.

Maple sap at the spout was shown to vary in sugar content from about 1 to about 7 percent. There was a wide range of variability in sugar content among trees in a single sugar lot, and when sugar-content averages were compared, a wide range of variability was apparent among sugar lots. The sugar content of the sap decreased as the season progressed.

Preserving poultry feathers (*U. S. Dept. Agr., Sec. Agr. Rpt., 1944*, p. 185).—Under the method described, wet feathers can be preserved in good condition for the period of several weeks needed to get them to processing plants, by means of a preservative prepared from common salt and hydrochloric acid, used in the proportion of 15 lb. of salt and 1 pt. of concentrated hydrochloric acid dissolved in 30 gal. of water for each 15 lb. of wet feathers. The solution costs initially only about 1½ ct. per pound of wet feathers treated, and the expense is further reduced by the fact that the solution can be used over again for several lots of feathers. The treatment does not injure the inherent fluffiness of the feathers. It makes possible the salvage for industrial use of millions of pounds of chicken feathers that formerly were wasted or used as low-grade fertilizer.

A light box for taking photographs in black and white or color, M. C. RICHARDS. (N. H. Expt. Sta.). (*Science, 101 (1945)*, No. 2621, p. 312, illus. 1)—The box described and illustrated—with top and bottom lights adjustable as to distance—is said to overcome many of the problems usually encountered in taking pictures of plants to show disease symptoms. With the bottom lights on, the opal glass gives a white background without shadows for specimens up to 20 in. wide; for a dark background, black velvet cloth is placed over the glass. In photographing such objects as apples or tomatoes, reflection of the lights on the fruit is obtained—not objectionable and adding "life" to the pictures; in black and white, however, this can be avoided by fastening a very thin piece of tissue paper over the lights.

## AGRICULTURAL METEOROLOGY

General meteorology, H. R. BYERS (*New York and London: McGraw-Hill Book Co., 1944*, pp. 645+, illus. 300).—"The present need in meteorology seems to be for a general text embodying the fundamentals as well as the modern developments in synoptic meteorology. . . . This book is an attempt to meet this need."

Methods in climatology, V. CONRAD (*Cambridge: Harvard Univ. Press; London: Oxford Univ. Press, 1944*, pp. 228+, illus. 46).—"For the most part, climatographies have been written by geographers. Therefore, geographical methods are kept in the forefront, and specifically climatological methods are not so much used. It would be satisfying if this book offered a bridge connecting the two realms." The general introduction presents climatology as a world science, and its international organization. The first two parts are concerned with the variations of the elements in the course of time at one fixed place; the third part presents a comparison of the elements which are observed synchronously at different places, and arrives at their geographical distribution; the fourth section gives suggestions for the arrange-

ment of a more or less complete climatography. In the appendix, models for climatic tables are presented, a table for easy calculation of the probable error, an auxiliary table for computing the equivalent temperature, and a table giving the numbers of the consecutive days of the year. A subject index is provided.

Runoff histories in tree rings of the Pacific slope, E. SCHULMAN (*Geog. Rev.*, 35 (1945), No. 1, pp. 59-73, illus. 5).—The author reviews the literature (footnote references), describes the principles and methods used in this type of work, and presents a reconnaissance of the possibilities of applying such analyses to the northern and southern extremes of the Pacific slope. He concludes that centuries-long tree-ring indexes of precipitation, as in the southwestern United States, are possible of development in the semiarid Pacific Northwest; these should bear on regional problems in climatology, ecology, and archeology. For southern California a preliminary 465-yr. index has been developed representing a first approximation to the history of seasonal precipitation and runoff in the southern Sierra Nevada and Coast Ranges; it would seem to require only a more comprehensive field collection of specimens to provide a sufficient basis for computing long-time statistical characteristics of the fluctuations in precipitation and runoff in this region. Two regions are thus added to the network of centuries-long indexes of climate; it is hoped that with a sufficiently wide distribution of these areas new light will be thrown on the problem of long-range seasonal weather forecasting.

A slide rule for computing gradient winds, G. R. KENDALL (*Amer. Met. Soc. Bul.*, 26 (1945), No. 1, pp. 5-8, illus. 3).

The Gulf Stream and the weather, J. W. SANDSTRÖM (*Arkiv. Mat., Astron. och Fys.*, 30 (1944), No. 4, pp. 1-12, illus. 9).—In this paper on the problem of long-term weather forecasts, the author attempts to show that the previous opinion that a warm Gulf Stream will always produce warm winters in Europe is untrue. He states that the southern part of the Gulf Stream has no influence on the weather. If its warmth is concentrated in its middle part, the winter will be cold in Europe—and colder the warmer it is. If the northern part of the Gulf Stream is warm, the winter will be warm in Europe and cold in Greenland, the difference being more pronounced the warmer the Gulf Stream is. The direction of the Gulf Stream from southwest to northeast is of fundamental importance in relation to its warming effect on Europe. The barometric pressure is the principal means by which the influence of the sea on the atmosphere is distributed far into the surrounding land areas; it should be thoroughly studied with special reference to this point.

Monthly Weather Review [October-December 1944] (*Mo. Weather Rev.* [U. S.], 72 (1944), Nos. 10, pp. 205-220, illus. 10; 11, pp. 221-236, illus. 12; 12, pp. 237-259, illus. 13).—In addition to meteorological, climatological, solar radiation, and sunspot data in each number, No. 11 contains a contribution on The North Atlantic Hurricane of October 13-21, 1944 (pp. 221-223) and No. 12, North Atlantic Hurricanes and Tropical Disturbances of 1944 (pp. 237-240), both by H. C. Sumner.

The New England hurricane of September, 1944, C. F. BROOKS and C. CHAPMAN (*Geog. Rev.*, 35 (1945), No. 1, pp. 132-136, illus. 1).—A brief history of this hurricane, a discussion of the efforts at forecasting its course, and an account of its force and effects.

## SOILS—FERTILIZERS

[Soil and fertilizer investigations of the Bureau of Plant Industry, Soils, and Agricultural Engineering] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. Rpt.*, 1944, pp. 28-30; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1944, pp. 218-220).—The report includes a general statement of the broad program of

research in soil-management practices as well as information on progress of research for making munition nitrogen usable for fertilizer, a method of using superphosphate in farm-stock drinking water, improved fertilizer practices for potato production in Maine, and status of work and use of soil survey information.

**Studies on the nature of podzolization,** J. A. RICHARD (In *Cornell University Abstracts of Theses, 1943. Ithaca, N. Y.: Cornell Univ. Press, 1944, pp. 406-410*).

—Detailed analyses are presented, including mechanical composition of the soil, organic matter, heat of wetting of total soil and of organic-matter-free soil, pH, and mineralogical composition of the sand fraction; and chemical analyses of the colloids are presented for well developed Podzol under two different forest types. The soil samples were collected under hard- and softwood forest types in southeastern Quebec. The soil was developed from a ground moraine derived mostly from rock consisting of schist and sandstone.

**Growth and biochemical composition of bean plants as conditioned by soil moisture tension and salt concentration,** C. H. WADLEIGH and A. D. AVERS. (U. S. D. A.). (*Plant Physiol., 20 (1945), No. 1, pp. 106-132, illus. 9*).—Dwarf red kidney beans were grown to incipient flowering in 10-gal. containers filled with Fallbrook loam. These soils contained 0, 0.1, 0.2, and 0.4 percent of added sodium chloride on the dry soil basis. The 36 cultures were divided into 3 moisture tension series. Water was added when the soil moisture tension at the 4-in. depth had reached 250 cm. of water and 750 cm. of water for the first two series, respectively. Water was added to the third series when plants were wilted by midmorning, corresponding to tension greatly exceeding 800 cm. of water. Plant growth was inhibited as the soil moisture tension at time of irrigation increased, even though in some of the treatments the soil moisture was always above the wilting range. Progressive additions of sodium chloride to the soil caused progressive decreases in growth and yield of beans. Increasing soil moisture tension or salt concentration tended to cause an increase in the percentage of nitrate nitrogen in the plants and to have a similar effect, though less pronounced, on the percentage of soluble organic nitrogen. Consequently, increasing intensity of either type of stress tended to cause an increase in nitrate : soluble-organic-N ratio. The percentage of protein in the leaves increased with increased intensity of either type of stress. Soil moisture tension had no effect on percentage of reducing sugars, whereas increasing salt concentration was associated with a definite decrease in percentage of these sugars in the stems. The experimental treatments had little effect on percentage of nonreducing sugars or percentage of hemireserves. Increasing either soil moisture tension or salt concentration caused a very marked decrease in percentage of starch in the leaves.

**Effect of land use and season on runoff and soil loss,** T. L. COPLEY, L. A. FORREST, M. T. AUGUSTINE, and J. F. LUTZ. (Coop. U. S. D. A.). (*North Carolina Sta. Bul. 347 (1944), pt. 28, illus. 22*).—The effectiveness of different land-use practices and of various kinds and amounts of applied organic matter was determined on field plots of Cecil sandy clay loam soil laid out on a 10-percent slope. Pine and hardwood litter applied as an undisturbed mulch gave almost complete control of runoff and soil loss. Stable manure, compost, and woods litter, when applied annually to continuous cotton plots and spaded under, reduced runoff and soil loss to less than one-half that where no organic matter was applied. These applied materials likewise caused a sharp increase in cotton yield. Without the use of commercial fertilizer, the yield of seed cotton increased from 390 lb. an acre on the check plot to 1,600 lb. per acre and above where the organic matter was applied. The lower rates of application of organic material proved more efficient per ton applied than the higher rates, indicating that even a few tons per acre will be very beneficial. These results indicate that farmers can well afford

to conserve and utilize all such organic material available on the farm, much of which is raked and burned. Both forest cover and permanent sod gave almost complete control of runoff and erosion. The use of wheat and lespedeza in a 4-yr. rotation with cotton and corn reduced soil loss to an annual average for the rotation of 14.4 tons per acre as compared with 31.2 from continuous cotton and 66.2 from bare land.

An annual lespedeza sod reduced soil loss from the first row crop which followed, though to a lesser extent than the permanent sod, but there was no material reduction from the second row crop. Frequent burnings of the forest plot over a period of 7 yr. increased runoff over a hundredfold, or more than that lost from either cotton or corn in a 4-yr. rotation. The soil loss increased from practically none to nearly 8 tons per acre. The duration of runoff from the protected forested watershed was always greater than that from the cultivated watershed. The three summer months of June, July, and August accounted for 75-90 percent of the annual soil loss, both from the 4-yr. rotation and from continuous cotton where organic materials were applied. Arranging all rains causing runoff into amount and intensity groupings showed that serious soil losses were not necessarily caused by big rains, but rather by hard rains. The authors point out that the summer season constitutes the most critical period of the year and is the time when protective measures are most needed, particularly on cultivated land. Crop residues, contour tillage, and terracing should be utilized as conservation practices.

Water conservation in Great Plains wheat production, H. H. FINNELL. (Coop. U. S. D. A.). (*Texas Sta. Bul.* 655 (1944), pp. 31, illus. 11).—Results of terracing, contour farming, summer fallowing, and winter grazing under varying soil and seasonal conditions were determined from 901 records of wheat production in 11 soil conservation demonstration areas of the Southern Great Plains. Significant increases of wheat yield resulted from (1) initial soil moisture stores, (2) July rainfall previous to sowing, (3) level terracing and contour farming, and (4) favorable spring rainfall; while significant decreases resulted from (5) soil erosion damage, (6) delayed seeding, and (7) fall and winter grazing.

The practices of terracing and contour farming gave consistent yield increases averaging 2.99 bu. per acre, partly due to increasing the soil moisture accumulation during the preparatory period from 3.01 in. in depth of penetration per inch of rainfall to 3.68 in. and partly due to the more efficient utilization of rainfall during the crop growing season. Soil moisture accumulation during the preparatory period accounted for the entire favorable effects of summer fallowing and contour farming on wheat yield, but terraces continued to operate favorably, accounting for 1.64 bu. of the 2.99-bu. yield increase by more efficient use of rainfall during the crop growing season. The 1.35 bu. of yield increase effected previous to seeding may be broken down with 0.84 bu. creditable to contour farming and 0.51 bu. creditable to terraces. The total effect of terraces, therefore, was to increase the yield 2.15 bu. of wheat per acre, with 0.84 bu. added by contour farming. The total effect of contour farming on wheat yield was less than that expected from the use of this method in row crop production, apparently because of the more general use of flat methods of tillage in wheat growing than in row crop cultivation.

Qualitative studies of soil microorganisms, V, VI (*Soil Sci.*, 55 (1943), No. 2, pp. 185-195; 58 (1944), No. 6, pp. 473-479, illus. 2).—In extension of preceding studies of a similar nature (E. S. R., 84, p. 302), the authors report in the two papers here noted upon the wide variation in nutritional demands of various groups of soil organisms and upon the effect of the crop and of the nature of the added bacterial nutrients on these groups.

V. *Nutritional requirements of the predominant bacterial flora*, A. G. Lochhead and F. E. Chase.—Seven main nutritional groups were recognized. These ranged from organisms capable of maximum development in a simple basal medium to types unable to develop with supplements of amino acids, growth factors, or yeast extract and requiring soil extract for growth. The more fertile of the two soils studied showed a higher proportion of types with the more complex growth requirements than did the poorer soil. More detailed study of the requirements of individual cultures of one group (requiring amino acids and growth factors) showed wide variations between related forms.

With respect to correlation of nutritional requirements with morphological type it was noted that organisms with the simpler requirements consisted to a larger extent of spore-forming rods and gram-negative nonsporing rods. Pleomorphic forms related to corynebacteria comprised a greater proportion of organisms with more complex nutritional needs. Bacteria requiring soil extract for growth comprised 19 percent of the isolates. For most of these forms, the growth-promoting properties of soil extract were dependent upon a factor or factors not concerned with the ash constituents, but present in the acetone extract and capable of adsorption by charcoal and of recovery by elution. Soils were shown to vary greatly in the effectiveness of extracts prepared from them for certain organisms. For certain organisms requiring soil extract, the nitrilite effect of the extract could be replaced by a filtrate from cultures of other soil bacteria capable of maximum development in simple basal medium. For other organisms, similar filtrates were ineffective.

VI. *Influence of season and treatment on incidence of nutritional groups of bacteria*, H. Katzenbach and F. E. Chase.—In this paper, the authors conclude that continuous planting of one crop may be expected eventually to stabilize the microbial balance of the soil and result in a microflora which is characteristic of that crop. Annual change of crop, as in rotations, however, will merely cause temporary shifts of the equilibrium. Similarly, readily decomposable materials (dextrose) stimulate a temporary change in the equilibrium, which eventually reverts to its original state as a result of the powerful buffering capacity of the soil, whereas more slowly decomposable substances (cellulose) induce a shift of the bacterial balance which is not only more profound but also more persistent. These considerations are especially important if it is desired to modify the soil population for a specific purpose, as the elimination of a disease factor from soil or the stimulation of a microflora favorable to a particular crop.

Microbial activity and soil aggregate formation during the decomposition of organic matter, T. C. PELLE and O. W. BEALE. (U. S. D. A. coop. S. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 254-257).—As a check of field observations at Clemson, S. C., on the effect of size of organic particles on degree of aggregation, a pot experiment was conducted in which organic matter subdivided into different sizes was incorporated with soil and the rates of CO<sub>2</sub> evolution, nitrate content, and degree of aggregation determined at various intervals.

Greenhouse experiments revealed that the degree of subdivision of organic matter incorporated with soil has a very marked influence on the degree of aggregation produced. Crimson clover ground to pass a 0.5-mm. sieve was much more effective than similar material of 1 in. size in promoting aggregation. Greatest microbial activity occurred during the first 6 days of the decomposition period, and the rate of formation of water-stable aggregates was highest during this time. The high aggregation produced during the initial decomposition period persisted for several months after the microbial activity declined, but the larger aggregates were gradually converted into smaller aggregates.

Quantity of decomposition products as indicated by nitrate content showed that large amounts of all sizes of organic matter were decomposed and indicated that some factor other than the quantity of decomposition products accounts for the greater effectiveness of the finely ground organic matter in promoting aggregation. Mulches in greenhouse tests had little if any effect on aggregation and decomposed only slightly, in contrast with field observations where considerable improvement in aggregation has been observed and moderately rapid decomposition of the mulches occurs.

Some factors affecting the longevity of *Rhizobium* in Florida soils, G. D. THURNTON. (Fla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 238-240).—Field and greenhouse experiments are reported on the survival of *Rhizobium* on the light soils of the Coastal Plain area. Leon fine sand was used in the greenhouse, while Blanton fine sand and Plummer fine sand were used for the field studies. A soil pH near 6.0 was found to be necessary for the survival, in large numbers, of *R. trifoli* in Leon fine sand.

Calcium carbonate had a more stimulating effect on survival than muriate of potash or superphosphate. However, CaCO<sub>3</sub> used in combination with either muriate of potash or superphosphate was more beneficial than when used alone. The use of rock phosphate and superphosphate resulted in slightly better nodulation than did basic slag.

*Rhizobium* survived in sufficient numbers for inoculation, regardless of the source of the inoculum, in the soils studied under field conditions. In two instances locally isolated strains of Rhizobia persisted in greater numbers than did commercial strains, while in one instance the latter occurred in greater numbers. *R. trifoli* from the two sources gave excellent nodulation in the Plummer fine sand in the fifth dilution.

Maintenance level of nitrogen and organic matter in grassland and cultivated soils over periods of 54 and 72 years, J. W. WHITE, F. J. HOLBEN, and A. C. RIEHER. (Pa. State Col.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 1, pp. 21-31).—Studies of 20 plot soils involving 5 treatments on each of the 4 tiers located on Hagerstown silt loam, at the end of 54 and 72 yr. of continuous cultivation in a 4-yr. grain rotation and the adjacent grassland areas in permanent grass for the same period, have shown that in every one of the 20 comparisons the grassland soils have maintained a nitrogen and organic matter level considerably above that of the plot soils. The unfertilized grassland soils, at the end of 72 yr., show a nitrogen level 68.2 percent above the unfertilized plot soils, 40 percent higher than the PK treatment, 42.1 percent above the NPK treatment, 19.1 percent above the plot soils treated biennially with 6 tons of barnyard manure, and 11.9 percent above the 20-ton manure treatment.

Plots which have received biennial treatments of 48 lb. of phosphoric acid and 100 lb. of potash per acre since 1881 have maintained approximately the same nitrogen level as the plot soils which have been treated with heavy dressings of nitrate of soda, supplying 48 and 72 lb. of nitrogen per acre. On two unlimed tiers, the NPK treatment has maintained a nitrogen level only 4.8 percent above the PK-treated plots, compared with 4.3 percent for the two limed tiers. This fact, together with the high nitrogen content of the untreated grassland soils, serves to emphasize the importance of the nitrogen fixation in the scheme of soil fertility maintenance.

Yield-depression effect of fertilizers and its measurement.—II, Report on nutritional unbalance disclosed by field tests, O. W. WILLCOX (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 1, pp. 9-20, illus. 4).—Continuing previous papers (E. S. R., 40, 1, 733), the standard Mitscherlich-Baule-Willcox diagram was used to evaluate

a number of field tests involving treatment of wheat, corn, oats, soybeans, seed cotton, and Concord grapes with N and/or K in South Carolina, Illinois, and New York. These experiments exhibit typical yield depression when the amount of fertilizer is increased beyond the point of physiologic balance. The yield curve as a whole then consists of two limbs, a lower limb conforming to the normal Mitscherlich yield equation and an upper depression curve corresponding to the depression equation. The standard yield diagram applied to field experiments with plant nutrients should be useful in recognizing unbalance and measuring its degree.

**Commercial fertilizers for the irrigated sections of western Nebraska,** E. S. LYONS, J. C. RUSSEL, and H. F. RHOADES. (Coop. U. S. D. A.). (*Nebraska Sta. Bul.* 365 (1944), pp. 29, illus. 9).—It is found that the use of superphosphate in western Nebraska on soils which are calcareous at the surface, such as Mitchell and Minatare, is likely to result in increased yields of sugar beets, potatoes, alfalfa, and barley. Increased yields of corn may be expected from applications of superphosphate on these soils, although there is insufficient evidence at the present time to make definite statements. Navy beans respond less to an application of superphosphate than do the other crops mentioned. The magnitude of response of all these crops to phosphorus fertilization will be influenced by previous fertilization practice. Under certain conditions, applications of superphosphate may increase the yield of crops grown on soils that are noncalcareous at the surface, that is, Tripp soils. This is especially true after a period of cropping where no manure or only small quantities have been added to the soil. Superphosphate (45 percent  $P_2O_5$ ) should be applied at a rate of 100–150 lb. per acre to highly calcareous soils for sugar beets and potatoes where a phosphorus fertilizer was not used the previous year. On noncalcareous soils the rate may be 70–100 lb. per acre. The latter rates may be used for barley, corn, and sorghum.

Nitrogen fertilizers are not generally needed for potatoes since that crop commonly follows a legume. Where the crop does not follow a legume, a nitrogen fertilizer should be used on soils that are likely to be deficient in nitrogen. The few tests that have been made with potassium fertilizers on sugar beets, potatoes, and alfalfa indicate that potassium is not deficient in western Nebraska soils at the present time. Additions of fertilizers containing magnesium, manganese, iron, copper, zinc, or boron to western Nebraska soils do not appear to be needed for crop plants at the present time.

**Water solutions of mixed fertilizers: For use in starting and side dressing plants,** A. L. PRINCE and V. A. TIENJENS. (N. J. Expt. Stas.). (*Com. Fert.*, 70 (1945), No. 1, pp. 19–20).—The results of this study indicate that ordinary commercial grades of mixed fertilizer can be used in the production of liquid fertilizers for transplanting and side-dressing purposes.

**Ordinary and deep applications of fertilizer for corn, 1942–44,** J. PITNER (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 1, pp. 1, 2).—Three years' results under Delta conditions show that the yield of corn was increased as the amount of nitrogen applied was increased, regardless of the method of application. Applications of phosphorus and potassium in addition to nitrogen did not produce increases in yield greater than for nitrogen alone.

**Cumulative effects from heavy applications of nitrogen fertilizers,** R. J. BORDEN (*Hawaii Planter's Rec. [Hawaii Sugar Planters' Sta.]*, 48 (1944), No. 1, pp. 13–19, illus. 2).—Ten years' results of excessive applications of nitrogen on irrigated soils were found to have cumulative effects on soil pH and also to affect the solubility of some soil minerals. Sugarcane yields, however, were not proved to be differentially influenced by the soil changes.

Field experiments with phosphatic fertilizers, R. E. O'BRIEN (*Virginia Sta. Bul.* 364 (1944), pp. 26, illus. 4).—Field experiments are reported from the experiment station at Blacksburg and at substations located at Appomattox, Bowling Green, Chatham, Glade Spring, Holland, Staunton, and Williamsburg to determine the relative efficiency of seven phosphatic fertilizers, each compared in a rotation of crops adapted to the particular area.

Weighted average yield from all the experiments with corn showed that there was practically no difference in the relative efficiency of triple superphosphate, dicalcium phosphate, commercial superphosphate, and calcium metaphosphate, and that all were more effective than tricalcium, fused rock, and raw rock phosphates. The supplements used with triple superphosphate did not increase its efficiency.

Seven different experiments were conducted with small grain. In these the response to phosphate was more pronounced than with corn. No one phosphatic fertilizer proved to be outstanding in all the experiments; instead, the weighted average yield showed that only minor variations existed, except that the tricalcium, fused rock, and raw rock phosphates were less effective than the other fertilizers. In the experiments with red clover, triple superphosphate was the most efficient fertilizer, but it was only slightly better than dicalcium phosphate. Since the land was limed regularly, the supplementary materials used with triple superphosphate were of little or no additional benefit in increasing the yield of red clover hay. The treatments with triple superphosphate and calcium metaphosphate gave the highest average yield, but from the standpoint of quality, commercial superphosphate was slightly better than any other material.

Alfalfa made the best yield of hay at Chatham where commercial superphosphate was used; but in a rotation at Williamsburg, triple superphosphate was slightly better than any other source of phosphate. When the results of the two experiments were combined, there was little difference in the efficiency of triple superphosphate, commercial superphosphate, and dicalcium phosphate. For cotton and peanuts at Holland, triple superphosphate supplemented with dolomitic limestone was the most effective treatment, probably because of the magnesium supplied in the dolomitic limestone. Aside from the treatments in which supplements were used, commercial superphosphate gave the highest average yield of cotton and calcium metaphosphate the highest yield of peanuts. At Williamsburg, triple superphosphate produced the highest average yield of potatoes. The most effective phosphatic fertilizers for a complete rotation of crops on a specific soil type were as follows: Commercial superphosphate for the corn-rye-clover rotation on Cecil sandy loam at Chatham and for the corn-wheat-clover rotation on Berks silt loam at Staunton; triple superphosphate for the corn-wheat-clover rotation on Dunmore silt loam at Glade Spring and for the corn-potatoes-alfalfa rotation on Sassafras fine sandy loam at Williamsburg; calcium metaphosphate for the corn-wheat-clover rotation on Cecil clay loam at Appomattox; triple superphosphate supplemented with gypsum for the tobacco-wheat-clover rotation on Cecil clay loam at Appomattox, the corn-wheat-clover rotation on Dunmore silt loam at Blacksburg, and the tobacco-wheat-clover rotation on Sassafras sandy loam at Bowling Green; triple superphosphate supplemented with dolomite for the cotton-peanuts-corn rotation on Onslow fine sandy loam at Holland.

The relative efficiency of the different phosphatic fertilizers, as determined by their weighted average relative ratings for all the experiments combined, showed the following percentage increases over the check: Triple superphosphate 36 percent; commercial superphosphate 35; dicalcium phosphate 31; calcium metaphosphate 29; tricalcium phosphate 24; fused rock phosphate 23; and raw rock phosphate 12 percent. When the supplements were used with triple superphosphate, the following increases over the check resulted: Triple superphosphate and gypsum 39

percent; triple superphosphate and dolomite 33; and triple superphosphate with ground and granular slag, both 31 percent. Of the four supplements used, only triple superphosphate and gypsum gave a higher percentage increase than triple superphosphate without a supplement.

Responses of plants to additions of manganese to some Oregon soils, A. W. MARSH and W. L. POWERS. (*Oreg. Expt. Sta.*). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 1, pp. 1-8).—Greenhouse and laboratory studies are reported of plant responses to added manganese on peat soils. Slight yield increases were obtained on basic Klamath peat and on acid Braillier peat; inconsistent responses were obtained from the acid Lake Labish peat and the moderately acid Clatskanie peat. The acid Braillier peat is subject to alternate submergence and dessication. Field trials on slightly to moderately acid mineral soils showed little or no benefit from manganese treatments.

## AGRICULTURAL BOTANY

Plants and the material basis of civilization, E. W. SINNOTT (*Amer. Nat.*, 79 (1945), No. 780, pp. 28-43).—This stimulating contribution—part of a symposium on the biology of human progress—stresses the points that plants have almost a monopoly on the syntheses of those materials which are of primary importance to life, holding, "so to speak, the basic patents of the organic world"; and that agriculture, without a revision of its resources and methods in the light of the newer knowledge of these plant syntheses, will hardly be able to feed abundantly a much more densely populated world. Clearly, one of the major tasks of those who would improve the service of plants to man is to learn more about the manner in which protoplasm builds these compounds which provide the energy and form the physical basis of all life. In spite of the results of modern progress in studies of carbohydrate and protein metabolism such, e. g., as those on yeast in the production of feeds for livestock and meat substitutes for man, better utilization of the products of plant metabolism in the sea, and the newer knowledge on antibiotics and vitamins, economic botany is still in its infancy. Plant syntheses still have two fundamental advantages over those in the laboratory: Even though various plant products can now be produced synthetically, this is in many cases uneconomical; and even where entirely new products are made—such as rayon and plastics—these must use as raw materials the basic products of plant syntheses or modifications thereof. Such developments necessitate the mass production of the raw materials needed by the chemist: Agriculture will still continue to be the primary profession of mankind. "So through the years grows man's dependence on those living machines, the cells of plants. . . . The intensive employment of plants to provide an ever wider material basis for our civilization is one of the major tasks of our time, and here botanical science faces an opportunity for highest service to the life of man."

Fundamentals of bacteriology, M. FROBISHER, JR. (*Philadelphia and London: W. B. Saunders Co., 1945, 3. ed., pp. 824+, illus. 399*).—This edition (E. S. R., 84, p. 23) "has been completely reorganized, with rearrangements looking toward greater usefulness in teaching and greater unity in treatment. The stress on taxonomy, characteristic of the second edition, has been eliminated and a functional treatment maintained with practical applications wherever possible." Much new material has been added, including, e. g., methods of cultivation in chick embryos, tissue cultures, electron and fluorescence microscopes, and penicillin and other antibiotics. In addition to the general, agricultural, industrial, and medical aspects of bacteriology, there are chapters on yeasts and molds, plant diseases, Rickettsias, viruses, and pathogenic protozoa. There are three colored plates.

Investigation into the production of bacteriostatic substances by fungi.—V, Preliminary examination of the third 100 fungi, with special reference to strain variation among species of *Aspergillus*, W. H. WILKINS and G. C. M. HARRIS (*Brit. Mycol. Soc. Trans.*, 27 (1945), pt. 3-4, pp. 113-118).—During these studies (E. S. R., 88, p. 601; 90, pp. 596, 737; 92, p. 626) the authors were increasingly impressed with the importance of regarding every isolation as an individual fungus whose physiological potentialities were probably quite distinct from other isolations/strains of the same species. This was found true not only for *Aspergillus* spp., since the concentration of crude "claviformin" also varied greatly in relation to the different strains of *Penicillium claviforme* used; definite strain variation was also found from strongly positive to strongly negative in the larger basidiomycetes investigated. As the medium on which the fungus is grown in the laboratory is responsible for so much variation in results, it may well be that the substrate of the natural environment is also a factor in determining the subsequent reactions of the strain when isolated and grown in culture. Though direct evidence is lacking, the authors incline strongly to this view.

Investigation into the production of bacteriostatic substances by fungi.—VI, Examination of the larger Basidiomycetes, W. H. WILKINS and G. C. M. HARRIS (*Ann. Appl. Biol.*, 31 (1944), No. 4, pp. 261-270).—The results of testing some 700 species are presented. Initially, the juice extracted from the sporophore was tested, followed in certain cases by a test of the metabolism solution produced by the fungus in culture. The findings indicate the larger Basidiomycetes to be among the more promising fungus groups which produce antibiotics, comparing favorably in this respect with species of *Aspergillus* and *Penicillium*. Of the 700, about 70 were strongly and about 100 weakly positive against *Staphylococcus aureus* and/or *Bacterium coli*.

The production of an antibiotic substance similar to penicillin by pathogenic fungi (dermatophytes), S. M. PECK and W. L. HEWITT (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 6, pp. 148-153, illus. 1).—This factor appeared to be similar to penicillin in its enhanced production in corn-steep liquor media, spectrum of activity and behavior toward penicillin-resistant organisms, sensitivity to pH and temperature, and destruction by clarase.

Sterility test for penicillin employing cysteine for inactivation, R. J. HICKEY (*Science*, 101 (1945), No. 2618, pp. 232-234).

Notes on Florida fungi, III, E. WEST. (*Fla. Expt. Sta. Mycologia*, 37 (1945), No. 1, pp. 65-79, illus. 2).—Notes are included on 35 species, including many rust, smut, and other plant-parasitic fungi, with 3 species described as new (E. S. R., 85, p. 171).

Developmental studies in the fungi.—I, The foot-cell in *Aspergillus clavatus* Desm., R. KLEIN (*Brit. Mycol. Soc. Trans.*, 27 (1945), pt. 3-4, pp. 121-130, illus. 19).—As part of an investigation into the formation of the conidiophore in the genus *Aspergillus*, a careful study was made of *A. clavatus*. Sufficient stages were found to allow a reconstruction of the process in this species, though the results of course may not apply to the whole genus; the detailed findings are presented and illustrated.

Notes on the Geoglossaceae of Bermuda, J. M. WATERSTON, J. W. SINDEN, and H. H. WHETZEL. (*Cornell Univ. et al. Mycologia*, 37 (1945), No. 1, pp. 32-36, illus. 1).—Notes on species of the fungus genera *Trichoglossum*, *Geoglossum*, and *Mitrula*, with a description of *M. bermudiana* n. sp.

Mold preventive for book bindings, D. C. HETHERINGTON (*Science*, 101 (1945), No. 2618, p. 223).—Success is reported with a solution made up of thymol crystals 10 gm.,  $HgCl_2$  4 gm., ether 200 cc., and benzene 400 cc. Since it is both poisonous and flammable, care must be used in applying it.

[Louisiana plants] (*La. Acad. Sci. Proc.*, 8 (1944), pp. 25-47, illus. 2)—The following are included: Plant Distribution in Relation to the Geology of Louisiana, by W. T. Penfound (pp. 25-34), and Historical Commentary on the Distribution of Vegetation in Louisiana and Some Recent Observations, by C. A. Brown (pp. 35-47) (La. State Univ.).

A second supplement to the catalogue of Iowa plants in the Iowa State College herbarium, A. HAYDEN. (Iowa Exptl. Sta.). (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 2, pp. 111-132).—A further copiously annotated list (E. S. R., 83, p. 596).

Flora of Alaska and adjacent parts of Canada: An illustrated and descriptive text of all vascular plants known to occur within the region covered.—Part III, Cyperaceae to Orchidaceae, J. P. ANDERSON (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 2, pp. 133-205, illus. 167).—A further installment (E. S. R., 92, p. 26).

The botanical work of the cinchona missions in South America, W. C. STEERE (*Science*, 101 (1945), No. 2616, pp. 177-178).—A brief account of botanical surveys in Latin America for plants yielding economic quantities of alkaloid.

Poisonous plants of Hawaii, H. L. ARNOLD (*Honolulu, Hawaii: Tongg Pub. Co.*, 1944, pp. 71, illus. 24).—This semipopular manual gives, first, a list of those common and dangerous plants which experience has shown are frequently the source of serious poisoning and, second, a comprehensive list of all the plants noted by various authors as dangerous, with all the available information about them. A subject index and 48 references are included.

A botanical study of the yam beans (*Pachyrhizus*), R. T. CLAUSEN ([*New York*] *Cornell Sta. Mem.* 264 (1944), pp. 38, illus. 13).—Current interest in these legumes arises from the poisonous property of the seeds, the resins in the cotyledons having value as insecticides. Herbarium and field studies offer the basis for this report, involving the synonymy and description of the genus and descriptions of the six species (with key), three of which—*P. strigosus*, *P. panamensis*, and *P. versinalis*—are here described as new. These six species are what some biologists call "representative species." They replace each other geographically and are believed to have evolved as a result of geographical and ecological isolation; very little overlapping occurs between the ranges of the several species. Morphological intermediates between them are practically unknown. *P. ahipa*, *P. crosus*, and *P. tuberosus* are all important for their edible tubers; the last two and *P. strigosus* form resins of insecticidal value, but only further research on the seeds of these and other species will reveal whether any of them are of commercial or medicinal importance. Varieties occur in most of the species, and two new varietal combinations and two new varieties are proposed. A table summarizes and contrasts the outstanding characteristics of the known species, and the differences among the seeds of five and the distribution of four of them are illustrated.

Dipterocypsela, a new genus of Vernonieae from Colombia, S. F. BLAKE. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 2, pp. 36-38, illus. 1).—A description and illustration of the composite *D. succulcita* n. gen. and sp. are presented.

A new form of the moonvine *Calonyction aculeatum* with divided corolla limb, and length-of-day behavior and flowering of the common form, H. A. ALLARD. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 2, pp. 33-36, illus. 1).—The origin, length-of-day behavior, and other characteristics of *C. aculeatum apopetalum* n. f. are described.

An abnormal peppergrass, C. L. HITCHCOCK (*Madroño*, 8 (1945), No. 1, pp. 29-31, illus. 1).—Description of an unusual teratological form of peppergrass or pepperweed, believed to be *Lepidium schaffneri*.

A cyto-taxonomic study of the North American species of *Melica*, W. S. BOYLE. (Univ. Calif.). (*Madroño*, 8 (1945), No. 1, pp. 1-26, illus. 3).—It is now recognized that a clear understanding of the taxonomy of any group of plants will be greatly facilitated by a knowledge of the cytology and breeding behavior of the species in question. This study is an attempt to apply such data with the evidence from morphology and geographic distribution in defining the specific lines and probable relationships of the North American species of melicgrass or oniongrass.

An ecological study of four species of sumac in relation to development and growth on eroded soil, I. L. BOYD (*Kans. Acad. Sci. Trans.*, 47 (1944), No. 1, pp. 51-59, illus. 7).—The four species—*Rhus aromatica*, *R. copallina*, *R. glabra*, and *R. typhina*—were chosen for studies involving adaptation to the soil and climatic conditions, growth rate, spread by root sprouts, and value in erosion control and tannin production. From the results of these observations and experiments it is concluded that the favorable responses by the smooth sumac (*R. glabra*) warrants its use both in erosion control and as an economic tannin-producing plant.

Nitrogen fixation in leguminous plants.—IV, The influence of reaction on the formation of root nodules in *Medicago* and *Trifolium*, H. L. JENSEN (*Linn. Soc. N. S. Wales, Proc.*, 68 (1943), pt. 5-6, pp. 207-220).—In continuation (E. S. R., 91, p. 653), these studies of nodule formation on seedlings grown in agar media differing in reaction indicated pH 5.3-5.4 to be the critical range for *Medicago*; in several species of *Trifolium* nodule formation was seen at pH 4.5 and even at 4.2. When once formed, nodules could continue to fix N at pH values too low for their formation de novo. When alfalfa and subterranean clover were grown in various sand and soil media at approximately pH 5-7.5, as a rule fewer and bigger nodules were produced with increasing acidity; this effect varied considerably in different tests, but on the whole was more pronounced in the alfalfa. Both plants formed nodules in natural soil at pH 4.9-5, whereas sand acidified with  $H_2SO_4$  appeared very unfavorable to nodule formation. The yield of alfalfa was reduced below pH 6; that of clover was little affected. The dry matter yields and N percentages of the plants, as well as the number and size of nodules, apparently depended not only on the pH value, but also on the composition of the growth substrate. The relative weight of the nodule substance was constantly—and the actual weight frequently—increased at acid reactions. There was evidence of an inverse correlation between the N-fixing efficiency of the nodules and the H-ion concentration of the growth substrate.

The internal reaction of root nodules was found to be pH 5.55-6.32 (average pH 5.92); the root tissues were on the whole slightly more acid. No significant correlations were observed between the pH values in nodules, roots, and growth substrates—the last being approximately 5-8. In roots of young seedlings of alfalfa and subterranean clover the reaction appeared to vary in the same direction as that of the growth substrate, but remained within the limits of pH 5.5-6.1. Generally, the influence of the soil reaction on nodule formation appeared to differ from that on the subsequent N-fixing activity, and the latter was subject to wider pH limits, i. e., the free-living Rhizobia were more sensitive to acid reaction than the N-fixing complex of plant + Rhizobia.

Einfluss von Vitamin B<sub>1</sub> auf Wachstum und Ertrag verschiedener Kulturpflanzen [Influence of vitamin B<sub>1</sub> on the growth and yield of various crop plants], L. GESIGER (*Landw. Jahrb. Schweiz*, 58 (1944), No. 1, pp. 54-66, illus. 6; *Fr. abs.*, pp. 65-66).—In the pot experiments reported, thiamine failed to show any favorable influence on the development of sunflower, corn, wheat, flax, or bean plants; similar yields were obtained with or without added thiamine. Since this

vitamin is indispensable to plant growth, it is concluded that these plants are able to elaborate sufficient amounts for their normal development.

Riboflavin production by *Candida* species, F. W. TANNER, JR., C. VOJNOVICH, and J. M. VAN LANEN. (U. S. D. A.). (*Science*, 101 (1945), No. 2616, pp. 180-181).—The experimental results summarized in this preliminary report indicate that when the synthetic medium employed was practically free of Fe, both cell proliferation and riboflavin synthesis by *Candida* spp. were retarded; the Fe concentration required for maximum riboflavin production was, however, much lower than that needed for maximum growth. When the basal medium was supplemented with Fe to raise its concentration to 0.5-1 µg. per 100 cc., the highest yields of this vitamin were obtained. It was also found that various sugars and many organic and inorganic N compounds reportedly inhibitory to vitamin synthesis may be used in media for riboflavin production by these fungi if proper adjustment is made of the Fe level.

Changes in electrical polarity in the *Avena* coleoptile as an antecedent to hormone action in geotropic response, A. R. SCHRANK (*Plant Physiol.*, 20 (1945), No. 1, pp. 133-136, illus. 1).—When the oats coleoptile is placed horizontally it responds to gravity by curving upward, by accumulating more growth hormones in the lower than remain in the upper half, and by establishing a transverse electrical polarity oriented so that the under side becomes electropositive to the upper side in the external circuit. It is generally accepted that the unequal hormone distribution is an essential precursor for the upward bending; also it has been suggested that the transverse electrical polarity might be the required orienting force. An analysis of the experimental data from the literature (11 references) along with that here presented establishes the following sequence of responses of the oats coleoptile to gravity—establishment of a transverse electrical polarity, unequal distribution of the growth hormones, and upward curvature. Furthermore, it also becomes clear from this study that the transverse electrical polarity is established in the coleoptile before a difference in hormone concentration is considered possible. The fact that this polarity is established prior to the unequal hormone distribution does not, of course, necessarily mean that it is actually the orienting force or polarity essential for lateral hormone transport; it does, however, mean that the transverse electrical polarity fulfills the prime requirements of being established in the correct sequence.

The influence of heparin on growth of *Lupinus albus* seedlings, D. I. MACHT (*Plant Physiol.*, 20 (1945), No. 1, pp. 24-39, illus. 2).—When root growth of white lupine in various concentrations of purified heparin was studied in standardized solution at 20° C. in the dark for 24-hr. periods, certain concentrations proved definitely stimulatory while others were inhibitory, thus yielding several peaks and depressions in the plotted growth curve. Such an effect was produced by all specimens examined. The sodium salt of polyanethol sulfuric acid—a chemical homologue of heparin—was, however, more toxic to plants than heparin itself and failed to stimulate growth but inhibited it progressively in proportion to the increase in concentration of the solutions used.

Controlling the pH of cultures of *Penicillium notatum* through its carbon and nitrogen nutrition, A. E. DIMOND and G. L. PELTIER. (Univ. Nebr.). (*Amer. Jour. Bot.*, 32 (1945), No. 1, pp. 46-50, illus. 4).—This study was concerned with the relation between pH of the nutrient medium and time of incubation, particularly as this relation is affected by varying the sources of N or sugar. When nitrate N was supplied, the pH first dropped slightly and then gradually rose to the range favoring penicillin production; this was observed for sucrose, lactose, glucose, brown sugar, maltose, and galactose. With amino acids present, the relation of pH to time of incubation varied with the sugar: For lactose, the

pH remained practically constant at 7; with maltose, it dropped slightly to about 6, then remaining constant, and for fructose, the same type of curve was obtained; for sucrose, glucose, galactose, and mixtures of glucose and fructose and of glucose and galactose, the pH fell to 3.5-4.5 and remained there until initiation of autolysis. The relation of such behavior to sugar metabolism is discussed. When amino acids and nitrate N were supplied together, the pH fell somewhat, but not to so great an extent as with amino acids alone, and it rose again to a level intermediate between those observed for nitrate alone and amino acids alone. These results suggest that by supplying the proper medium to *P. notatum* cultures, control of the pH of the medium may be maintained. The relation of pH to penicillin production is by now well known. Such technics for pH control, together with the fact that growth becomes rapidly established on amino acid media, may find use in the production of penicillin.

Some effects of pH on the growth of citrus in sand and solution cultures, P. L. GUEST and H. D. CHAPMAN. (*Calif. Citrus Expt. Sta.*). (*Soil Sci.*, 58 (1944), No. 6, pp. 455-465, illus. 3).—Three separate culture experiments are reported—two in sand and one in solution at pH 2-11—in this study of the effects of pH on growth of citrus, special attention being given to the direct as contrasted with the well-recognized indirect effects. At the extremes, citrus plants were killed within a few days. At pH 2.5 and 3, plant life persisted for months, but little or no growth occurred. Good growth was obtained at pH 4-9.7, though difficulties caused by the indirect effects were encountered and the actual limits at which H and OH ions begin to exert direct deleterious effects were thus not established. Despite these complications, the results are believed to warrant the conclusion that H- and OH-ion concentrations corresponding to pH values from slightly below 4 to somewhat above 9 exert no appreciable direct ill effect on the growth of sweet orange plants.

A method for the culturing of excised, immature corn embryos in vitro, A. J. HAAGEN-SMIT, R. SIU, and G. WILSON (*Science*, 101 (1945), No. 2618, p. 234, illus. 1).—A method adapted from one developed by van Overbeck et al for *Datura* (E. S. R., 91, p. 523) was found applicable to the culturing of excised corn embryos at 8-10 days after pollination and 0.3-3 mm. in length. From the data reported, it is apparent that the so-called "embryo factors" of coconut milk are not limiting for the survival of corn embryos.

Iron and manganese in plant nutrition, H. L. PEARSE (*Farming in So Africa*, 19 (1944), No. 224, pp. 688-694, illus. 6).—The author presents a brief review of previous work along this line and summarizes experiments on Fe and Mn deficiency in the Cape gooseberry (*Physalis peruviana*) and strawberry (*Fragaria vesca*).

The synthesis of sucrose in the sugar cane plant—IV, Concerning the mechanism of sucrose synthesis in the sugar cane plant, C. E. HARTT (*Hawaii Planter's Rec.* [Hawaii. Sugar Planters' Sta.], 48 (1944), No. 1, pp. 31-42).—In this contribution of the series (E. S. R., 90, p. 578), the author concludes from experimental data here presented and from critical examination of published work by herself and others (85 references) that the mechanism of sucrose syntheses in sugarcane includes both phosphorylation and aeration. The process is outlined as follows: Through the aid of hexokinase, some of the glucose absorbed by the leaf blades is phosphorylated by the energy-rich phosphate bond of the adenosine triphosphate already present therein. This aerobic process results in the formation of more energy-rich phosphate bonds—perhaps by dehydrogenation of malic acid—and these bonds are used for reformation of adenosine triphosphate. Some of the phosphorylated glucose is converted to fructose monophosphate and then to fructose diphosphate. Some of the latter may be broken down anaerobically, but

most of it combines with glucose, using the energy released by phosphorylation and forming a sucrose phosphate. A phosphate acceptor such as thiamine or riboflavin—with perhaps the aid of a specific phosphatase—accepts the phosphate, and thus sucrose is formed. These reactions probably take place practically instantaneously in the plant.

Fructose is as good a substrate as glucose for sucrose synthesis. Following the above outline, the phosphorylation of fructose should result in the formation of fructose-6-phosphate. Some of this fructose monophosphate would need to be converted to fructose diphosphate, while some would be changed to glucose monophosphate and then to glucose. The glucose would then combine with the fructose diphosphate, resulting in the formation of sucrose phosphate. Thus the formation of sucrose would take place by the same mechanism whether glucose or fructose were the starting point, the only difference being that both reactants have to be made when fructose is supplied, whereas only one is required when glucose is supplied. Sucrose formation in the plant results not only in a storing of sugar, which is thus not all broken down at once, but also in the release of phosphate which can be used again. There are 85 references.

**Studies in tropical fruits.—XVI.** The distribution of tannins within the banana and the changes in their condition and amount during ripening, H. R. and E. BARRELL (*Ann. Bot. [London]*, n. ser. 9 (1945), No. 33, pp. 77-99, illus. 9).—In this further study (E. S. R., 91, p. 416), making use of a tentative method for estimating tannins depending on the diastase-inhibiting property of "free" or "active" tannin in aqueous solution, about four times as much active tannin was found in the skin as in the pulp of the freshly harvested banana. During storage the amount fell in both skin and pulp, particularly in the stage immediately preceding attainment of the "sprung" condition by the fruit. Small but approximately constant amounts remained in the pulp and skin—about twice as much in the latter—during the eating and overripe stages. The pulp of abnormal ripe fruit—e. g., chilled or from cercospora leaf spot-infected plants—contained more active tannin than in normal fruit. The slow oxidation of crude banana tannins gave rise to colors similar to those found in the pulp of fruit from the leaf spot-infected plants and in the skin of chilled fruits. There are 32 references.

**Oxidation systems in the potato tuber,** J. G. BOSWELL (*Ann. Bot. [London]*, n. ser., 9 (1945), No. 33, pp. 55-76, illus. 6).—Oxidation systems involving polyphenols and ascorbic, dihydroxymaleic, and four-carbon organic acids were examined in the potato tuber. Dihydroxyphenylalanine and caffeic and gallic acids formed cyclic redox systems with the oxidase present in that tissue. Ascorbic acid may be the coenzyme of a redox system not directly involving oxygen. No evidence was found of a dihydroxymaleic acid oxidase forming a cyclic redox system comparable to the polyphenol system. The four-carbon acids formed part of an oxidation system not controlled by the polyphenol oxidase, but linked with the supply of the H-donator which reduced the quinone. The H-donator for the quinone appears to be the amino acid group.

**Inadequacies in present knowledge of the relation between photosynthesis and the O<sup>18</sup> content of atmospheric oxygen,** M. D. KAMEN and H. A. BARKER (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 31 (1945), No. 1, pp. 8-15).—"Various lines of evidence strongly indicate that the oxygen of the atmosphere has been formed mainly by photosynthesis. If this conclusion is assumed to be correct, it follows that any specific relation between the substrates and products of photosynthesis that can be demonstrated in the laboratory should also be observable on a vastly larger scale in nature provided other interfering factors are not operative." The authors examine and discuss (17 references) the geochemical evidence for the photosynthetic origin of atmospheric oxygen, basic facts concerning oxygen iso-

topes and isotope exchange reactions, studies on the role of water as the source of photosynthetic oxygen, and the distribution of O<sup>18</sup> in nature. It is finally concluded that "in any event the existing inconsistency between the experimental evidence on the source of photosynthetic oxygen and the distribution of oxygen in nature cannot be regarded as valid evidence against the biological theory of the origin of atmospheric oxygen."

**Photosynthesis in maize as influenced by a transpiration-reducing spray,** C. G. BURR. (Mich. Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 1, pp. 86-97, illus. 4).—With the accumulation of sugars in the leaves used as a measure of photosynthetic activity, their maximum accumulation in the sprayed plants on the day after application was 62.1 percent that in the controls. Analyses 20 days after treatment showed the total sugar content of the leaves of sprayed plants to be about 18 percent greater than at the earlier sampling. Golden Cross Bantam was the corn variety employed; the emulsion used was one referred to in a previous paper, the basic constituents of which were a mixture of paraffin and vegetable oils (E. S. R., 91, p. 163). The relatively low rate of apparent photosynthesis in the sprayed plants probably can be attributed largely to a limited supply of CO<sub>2</sub>. The increased rate at which carbohydrates were produced by the sprayed plants on August 30 over that on August 10 may be explained in either of two ways—a change in the permeability of the waxy covering to CO<sub>2</sub> may have occurred during the 20-day interval, or CO<sub>2</sub> may have become more readily available as a result of the shrinking or cracking of the spray film. Although conclusive data are unavailable, the most reasonable inference from the findings is believed to be that the normal supply of CO<sub>2</sub> to the photosynthesizing cells of the control plants was inadequate to meet the requirements for maximum photosynthesis under existing conditions.

**Chlorazol black E as a stain for mycological specimens,** F. D. ARMITAGE (*Brit. Mycol. Soc. Trans.*, 27 (1945), pt. 3-4, pp. 131-133, illus. 5).—This acid dye was introduced as a biological stain in 1937; its uses are said to be numerous, since it can be successfully employed by the mycologist for staining many of the common Hyphomycetales, giving a depth of staining which is particularly valuable for specimens to be recorded photomicrographically. Its use as a cytological stain for fungi has yet to be explored, but it was found that the staining reaction is greatly increased if absolute methyl alcohol is substituted for the 70 percent ethyl alcohol; as a stain in the former solvent it may also prove of more universal value. Procedures for permanent slides and for the use of dioxan with this stain are presented.

**A critical survey of the present status of plant embryology,** D. A. JOHANSEN (*Bot. Rev.*, 11 (1945), No. 2, pp. 87-107).—According to the author, "it might be stated that the most that can be said for the present status of plant embryology is that it is in a curious muddle," the main reason given being that very few botanists seem to realize it as having become an exact science. First defining plant embryology, the author then proceeds to discussions of the contributions of R. Souèges, the laws of embryogeny, classification of angiosperm embryonic types, embryological distinctions between dicots and monocots, apomictic embryos, polyembryony, the extent of embryological studies, the Hanstein histogen concept, embryology, and genetics, and the microtechnical aspects of embryology.

**Periclinal chimeras in *Datura* in relation to the development and structure of the ovule,** S. SATINA (*Amer. Jour. Bot.*, 32 (1945), No. 2, pp. 72-81, illus. 24).—The ovule was found to be initiated from the innermost layer and the nucellus from the median layer, while the integument arises at the level just below the base of the archesporial cell and develops from the outermost layer. The archesporial cell arises in the subepidermal layer of the nucellus. Nucellar cells

surrounding the megasporangium are digested and absorbed during the development of the ovule; nucellar cells in the chalaza persist and remain active. The micropylar portion of the ovarian coat is formed by the integument; the chalazal portion is formed by nucellar cells.

**Air-space tissue in plants**, H. B. SIFION (*Bot. Rev.*, 11 (1945), No. 2, pp 108-143).—This comprehensive survey of the literature (168 references) takes up the subject by plant groups (thallophytes, bryophytes, vascular plants), ending with general considerations on the distribution, development, and functions of air-space tissues in the plant kingdom.

**Cleistogamy and chasmogamy in Bromus carinatus** Hook. & Arn., J. R. HARLAN. (Univ. Calif.). (*Amer. Jour. Bot.*, 32 (1945), No 2, pp. 66-72, illus. 6).—Observations on the appearance of cleistogamous florets in plants of this grass as grown under different environmental conditions and comparisons at several developmental stages between cleistogamous and chasmogamous panicles indicated the species to be facultatively cleistogamous, producing both types of florets on the same plant. Optimum flowering conditions induced chasmogamy; adverse conditions, cleistogamy. The developmental gradient in cleistogamous spikelets and inflorescences was much steeper than that in the chasmogamous type. Both types of florets may appear in the same panicle, due to an abrupt change in the developmental gradients at an early stage in the formation of a panicle. This steepness of developmental gradient in cleistogamous spikelets is associated with marked precocity in maturation of both ovary and pollen. Morphologically, cleistogamous flowers differ from the chasmogamous in having smaller floral organs—particularly anthers, stigmas, and lodicules.

**Fibre development of flax in relation to water supply and light intensity**, F. L. MILTHORPE (*Ann. Bot. [London]*, n. ser. 9 (1945), No. 33, pp. 31-53, illus. 8).—In the experiment described the quantitative anatomy of the plant was studied from emergence to maturity under four conditions of light intensity and water supply. Plants grown under shade in a greenhouse were much less developed than those without the shading, being shorter, with lower dry weight, smaller leaf area, higher water content, smaller fiber cells, lower yield and percentage of fiber, and lower number of fiber cells; the shaded plants failed to flower. Under shade there was no significant difference between plants grown under the two water treatments, probably because transpiration was too low for an effective drought. Under full greenhouse light the drought treatment resulted in a lower dry weight, shorter plants, smaller leaf area, less development of flowers and bolls, a lower yield but not lower percentage of fiber, and fiber cells of smaller size. Fiber cells at the base of the plant were few in number but very large, increasing in size throughout growth until flowering and then decreasing from shrinkage. The fiber cells higher in the stem were much smaller than at the base, but were far more numerous and closely packed; such are the requirements of good quality fiber. The cells at the higher stem levels increased in size and number up to maturity. The number of fiber bundles at any one position in the stem remained constant throughout growth. The increase in number of cells showing secondary deposition resulted in adding cells to previously existing bundles; the number of bundles at the base was less than higher up on the stem. As estimated by acid phloroglucin, fiber cells at the base of the stem were more heavily lignified than those at higher levels. At all stem levels except at the base the fiber cells in plants with normal water supply were more heavily lignified than in those under water-deficit conditions.

## GENETICS

**A list of chromosome numbers in higher plants.—I, Acanthaceae to Myrtaceae**, W. M. BOWDEN (*Amer. Jour. Bot.*, 32 (1945), No. 2, pp. 81-92, illus.

120).—Chromosome numbers are presented and figured for a large number of species and genera in 28 families of angiosperms.

The X-ray resistance of dormant seeds in some agricultural plants, A. GUSTAFSSON (*Hereditas*, 30 (1944), No. 1-2, pp. 165-178, illus. 3).—To determine the most suitable X-ray dosages for altering the genes and chromosomes in various cultivated plants, irradiation tests were carried out with dormant seeds; the critical dosages found which would still produce a fair amount of viable  $F_1$  progenies (field material) with at the same time a high rate of mutations and chromosome alterations are presented in tabular form. Seeds of several oil-producing plants (e. g., three crucifers and flax) proved highly resistant to X-rays, as contrasted with seeds of certain legumes and composites. Seeds of grasses were rather easily influenced, but withstood dosages up to 15,000 or 20,000 r. The chromosomes of the above oil plants are believed to be rendered resistant to X-ray hits and ionizations through some physiological properties within the cell and nucleus—possibly associated with the oil content. The chromosome breaks and gene changes consequently depend less on the number of direct hits than on some physiological conditions which cause the chromosomes to break or change after X-ray bombardment. Irradiation injuries thus imply secondary rather than immediate effects.

An efficient chemical for the induction of sticky chromosomes, G. ÖSTERGREN (*Hereditas*, 30 (1944), No. 1-2, pp. 213-216, illus. 1).—Ethylene glycol was found to induce chromosome stickiness in root tip cells of onion, with at the same time a low toxicity.

O "mosaico das leguminosas" agente perturbador da hereditariedade? [Does legume mosaic interfere with heredity?], L. DE AZEVEDO COUTINHO (*Agron. Lusitana*, 4 (1942), No. 4, pp. 273-292, illus. 14; *Eng. abs.*, pp. 290-291).—The apparent similarities in the characteristics and behavior of viruses and genes suggested the existence of a natural competition within the cell for needed materials. Studies by others have pointed to abnormalities in mitosis and meiosis in plants infected with viruses; these findings raised the question as to whether variations in the hereditary transmission of characters might be traced to such pathological conditions. *Vicia faba* plants inoculated with the legume mosaic virus soon exhibited symptoms showing spread of the virus to the different organs of the plant. The sexual cells of the parent generation were thus formed while the disease was in full progress, and almost all the seeds from the few viable fertilizations were wrinkled and small in size. All  $F_1$  plants from these seeds failed to show signs of mosaic during growth, but in addition to the phenotypically normal individuals there were others with abnormalities in stature and fruiting. Some of these plants were dwarfed and without offspring, but a portion of the  $F_2$  progeny obtained from a few of them reverted to the normal phenotypic condition without exhibiting any of the so-called "viromorphoses." The characteristics of the chromosome complements of the above three generations, the absence of mosaic symptoms in  $F_1$  and  $F_2$ , and the chemical composition of the viruses and genes led to the belief that the cases of nonviability in  $F_1$  plants were due to disturbances in the genome. On the other hand, special cytoplasmic conditions may have been responsible for the occurrence of viromorphoses, since they disappeared during the growth of the  $F_2$  plants.

Chromosome behaviour in a triploid rye plant, R. LÄMM (*Hereditas*, 30 (1944), No. 1-2, pp. 137-144, illus. 4).—Meiosis in a triploid twin rye plant is described, 0-6 trivalents occurring; these were of either the chain or frying pan type, the frequency of the latter proving unexpectedly high. Some—but not all—of the univalents divided at first and lagged at second anaphase. There was considerable elimination of the odd chromosomes of the triploid; its extent was determined

by counting the micronuclei in the young pollen grains and the chromosomes in the somatic pollen mitosis. The frequency of chiasma formation was determined and expressed in terms of half chiasmata per chromosome and number of chiasmata per nucleus. The terminalization coefficient of the triploid was high. Mature pollen of the diploid and triploid twin plants was examined in a mixture of glycerine and acetocarmine, the number of "good" grains in the triploid proving surprisingly high. As ♂ parent, however, the triploid was completely sterile. Data relating to pollen size in the diploid and triploid plants are given. Addition of an extra set of chromosomes in the triploid is shown to lead to less competition for chiasmata between the chromosomes. The upper limits of the chiasmata in the nucleus are believed to have been raised in the triploid.

**Cytological studies of extra fragment chromosomes in rye.—I, Iso-fragments produced by misdivision, A. MÜNTZING (*Hereditas*, 30 (1944), No. 1-2, pp. 231-248, illus. 30).**—In rye the normal somatic chromosome number is 14, but in several cases rye populations have been found to comprise individuals with an extra pair of small chromosomes. In the present report the cytology of plants with a single fragment chromosome in addition to the normal chromosome complement is described, and possible interpretations are discussed in the light of the findings and the literature (28 references).

**Desynapsis in the common wheat, H. W. Li, W. K. Pao, and C. H. Li (*Amer. Jour. Bot.*, 32 (1945), No. 2, pp. 92-101, illus. 16).**—Meiosis in desynaptic plants arising after a varietal cross is described in detail. Synapsis occurred in an apparently normal way in all the plants. In some of the desynaptic plants the chromosomes fell apart in pachytene; in others they fell apart in diplotene. Chiasmata in the desynaptic plants were mostly terminal at metaphase; rarely were some interstitial. Sometimes the bivalents were unequal, suggesting the pairing of chromosomes not completely homologous. Desynapsis is a simple mendelian recessive character, its gene being designated *ds*; it evidently arose as a spontaneous mutation after the original varietal cross. There are stable and unstable types of desynapsis which are possibly controlled by modifying genes. The mean bivalent frequency of the unstable type of desynaptic plants may show variation in relation to temperature. The fertility of desynaptic plants was significantly lower than in the normal but exhibited considerable variation.

**Experimentally induced chlorophyll mutants in flax, A. LEVAN (*Hereditas*, 30 (1944), No. 1-2, pp. 225-230, illus. 1).**—On three X-ray-induced chlorophyll-deficient mutants, with discussion of possible genetic analyses of the findings.

**On the normal occurrence of chromosome doublings in second-year root tips of sugar beets, A. LEVAN (*Hereditas*, 30 (1944), No. 1-2, pp. 161-164, illus. 1).**—Concerning the nature of the chromosome doublings reported, they are regarded as samples of the doublings normally occurring during the development of the sugar beet plant—as probably in every plant species. This type of polyploidy originates by endomitosis and seems to be started as soon as the cells attain a certain volume, either in the course of the normal growth of the tissue or as induced by external agents (the c-tumor reaction). It is believed easily understandable that the secondary root meristems of the old beets may contain cells which during their development have undergone endomitosis.

**Inheritance of ascorbic acid content in snap beans, B. L. WADE, P. H. HEINZE, M. S. KANAPAUX, and C. F. GAETJENS. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 70 (1945), No. 5, pp. 170-174, illus. 1).**—In this study, involving considerable preliminary work, it was found that in the cross U. S. No. 5 Refugee × Blue Lake and its reciprocal the quantity of ascorbic acid is a heritable character, and that there is evidence of transgressive segregation. Although the spring-grown  $F_2$  appeared to give only preliminary information it indicated transgression, and this

indication was confirmed by a summer-grown crop of  $F_2$  lines selected for high and low ascorbic acid content. These high and low  $F_2$  lines all differed significantly at the 1-percent level from the parent lines and gave values close to those observed for the corresponding  $F_2$  plants. In the fall the  $F_2$  population again indicated transgressive segregation; the  $F_2$  means did not. The 50  $F_2$  families taken strictly at random from the  $F_2$  plants did not include any families with average values significantly above or below those of the parents. Some  $F_2$  families, however, had as wide a range as the  $F_2$ . Additional evidence of transgression was found in 3  $F_2$  families. Much of the variability in ascorbic acid content of pods of U. S. No. 5 Refugee was found due to size and position on the plant, i. e., a variance of 5.02 for size and position with a remaining variance of 2.82 for all other factors involved during the fall of 1942.

**Hoodedness in Phlox.** J. P. KELLY. (Pa. Expt. Sta.). (*Jour. Hered.*, 36 (1945), No. 1, pp. 25-28, illus. 2).—Insofar as the genes are concerned, it is concluded on the basis of data presented that there appears to be a single allelic pair, *C-c*, distinguishing plane petals from hooded or cuculate petals in *P. drummondii*. The allele *c* when homozygous (*c-c*) conditions hooded or cuculate, whereas genes *C-C* condition a plane petalled phenotype. Often *C-c* plants are intermediately hooded, but with a variable expression. No attempt was made to correlate the varying expression here reported with specific seasonal or environmental influences suspected of causing the fluctuations.

**Strawberry breeding studies involving cross between the cultivated varieties ( $\times$  *Fragaria ananassa*) and the native Rocky Mountain strawberry (*F. ovalis*).** L. POWERS. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 70 (1945), No. 4, pp. 95-122).—This paper reports the results of breeding studies involving crosses between the cultivated varieties ( $\times$  *Fragaria ananassa*) and the native Rocky Mountain strawberry (*F. ovalis*). The percentage of strawberry seeds germinating varied from 31.1 percent for selfed Fairfax to 96 percent for the double cross [ $F_1$  (Fairfax  $\times$  36979)  $\times$   $F_1$  (Dorsett  $\times$  37501)]. Reciprocal crosses did not behave alike in respect to percentage or time of germination. The percentage of germination was greatest and the time required for germination least when the  $F_1$  generation was used as the female parent. The following characters showed either partial or complete dominance: A high degree of winter hardiness over winter injury; large over small size of fruit; a large over a small number of runners; a short over a longer period from May 1 to first bloom; and a short over a longer period from first bloom to first fruit ripe. Height of plant and the short period from May 1 to first fruit ripe showed heterosis. In both cases this heterosis was retained by the double cross [ $F_1$  (Fairfax  $\times$  36979)  $\times$   $F_1$  (Dorsett  $\times$  37501)]. The data on the frequency of the occurrence of plants possessing the more desirable of the contrasted characters showed that the opportunity for selecting the desired types was greatest among the plants of the backcross to Fairfax, certain  $F_1$  hybrids, and the double crosses. The studies on the frequency of the occurrence of plants recombinining desirable characters show that only in the case of days from May 1 to first bloom and days from first bloom to first fruit ripe did genetic linkage reduce the number of plants combining the desirable characters; that is, the number of such plants obtained was less than the number expected if the genes differentiating the contrasted characters are independently inherited. In the other 13 cases of nonindependence of the characters, the relations found either helped in obtaining the desired combinations of characters or had no effect. In 31 of the possible 45 cases the characters were found to be independent. On an average, 1 individual per 100 was found to recombine the following desirable characteristics: Extreme winter hardiness, large fruits, exceedingly vigorous plants,

ability to produce a large number of runners, and a date of maturity and quality of fruit similar to those of Dorsett and Fairfax.

The breeding of ornamental edible peaches for mild climates.—I, Inheritance of tree and flower characters, W. E. LAMMERTS. (Univ. Calif.). (*Amer Jour Bot.*, 32 (1945), No. 2, pp. 53-61).—From analyses of  $F_1$  and  $F_2$  progenies obtained by crossing the ornamental flowering Early Double Pink, Red, Peppermint Stick, and Chinese Dwarf Evergreen with the commercial varieties Babcock, Rio Oso Gem, and Socala, 11 factors were established in the peach as follows: A recessive factor  $dw$  causes a very dwarf habit, seedlings homozygous for it attaining only 1-1.5 ft. in height as compared with 5-6 ft. for the normal type at 2 yr. Seedlings homozygous for the duplicate  $b_{u1} b_{u2}$  factors are semidwarf bushy trees growing to only 2.5-3 ft. in 2 yr.; either factor alone exhibited no appreciable effect.  $L$  is a semidominant factor for large flower size in a showy ( $sh$ ) flowered class. As to color, there is a recessive  $r$  factor for red flowers, a recessive  $p$  factor for light pink, and a recessive  $w$  factor for white flowers. In order to be colored at all, flowers must have at least one dominant  $W$  factor. A variegation factor  $w^v$ —allelomorphic to white—is able to cause a variegation for red, pink, and white only when the plants are of the  $rr$  constitution, plants with  $Rr$  or  $RR$  being pink and white variegated. Three factors— $d_1$  completely recessive and  $d_{m1} d_{m2}$  incompletely recessive—determine the degree of doubleness. Plants with  $d_1 d_1$  have only 1-5 extra petals;  $d_1 d_1 d_{m1} d_{m2}$  plants, 10-16 petals as in Early Double pink; and  $d_1 d_1 d_{m1} d_{m2} d_{m3} d_{m4}$  plants, 15-24 petals as in Early Double Red and Pepper-mint Stick.

The ornamental flowering peach varieties have both the showy ( $sh$ ) factor established by Blake and the  $L$  factor, in addition to various grades of doubleness. Evergreen habit is recessive but depends on the interaction of several factors limited in expression by low relative temperatures. Low chilling requirement is due to the cumulative effect of a series of recessive factors and probably several semidominant ones also. The bearing these factors have on the problem of breeding ornamental flowering peaches of good edible quality is discussed.

*Pinus:* The relationship of seed size and seedling size to inherent vigor, F. I. RICHTER. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry*, 43 (1945) No. 2, pp. 131-137, illus. 1)—Studies at the Institute of Forest Genetics, Placerville, Calif., indicated that selection for inherent vigor within a progeny is ineffectual when based on size of seed. It is concluded that nursery differences between progenies of parents distinguished by seeds of different average sizes are unreliable as genetic guides except when progenies from the smaller seed are more vigorous than progenies from the larger seed. Continued mass selection among a heterogeneous population of trees growing on the same site, if based on size of seed, would merely result in a population that produces large seed.

The importance of uniformity of get in evaluating a sire, L. E. JOHNSON. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 2, pp. 109-120)—Study was made of the uniformity of 256 gets of sires in Herd Improvement Registry under the auspices of the Holstein-Friesian Association of America up to September 30, 1938. The gets of sires were grouped according to sires having 5, 10, 15, and 20 daughters with records. The pooled variance with its standard error of variance based on 5 daughters was  $9,762 \pm 6,903$ ; on 10 daughters,  $9,762 \pm 4,602$ ; on 15 daughters,  $9,762 \pm 3,690$ ; and on 20 daughters,  $9,762 \pm 3,167$ . The small effect that sires exerted on the uniformity of their get was directly associated with the degree of inbreeding and was therefore nonhereditary, as it could not be passed from sire to son in noninbred populations. The reduction in culs by selecting only sires which produced highly uniform gets was too small to be applicable to a breeding program. Selecting only sires that produced highly variable

gets and culling a given percentage of the poorest daughters was significant as regards the increase in average production of a herd. There appeared to be no justification for considering the uniformity of fat records or other characters when selecting proved sires, on account of the possible effects of environmental conditions.

**Heredity in dairy cattle: Lessons in breeding and herd development for 4H and FFA dairy clubs and other beginners,** J. E. RUSSELL (*Peterborough, N. H.: Amer. Guernsey Cattle Club, 1944, pp. 135+, illus. 15*).—The elementary principles of genetics are illustrated from the practices of successful breeders of dairy cattle.

**The methylene-blue reduction test and its relation to other measures of quality in bull semen,** N. L. VANDENMARK, E. MERCIER, and G. W. SALISBURY. (Cornell Univ.). (*Jour. Dairy Sci.*, 28 (1945), No. 2, pp. 121-128).—The relationship of the criteria for measuring the quality of semen from 39 bulls was investigated and correlation coefficients calculated. The methylene-blue test was not significantly correlated with the proportion of morphologically abnormal spermatozoa, the ascorbic acid content or the initial glucose level of the fresh semen, or the glucose loss in diluted semen after 10 days' storage at 5° C. Highly significant correlations were shown between the methylene-blue reduction time and the volume of ejaculate, spermatozoa count, initial spermatozoa motility, initial pH, and the initial lactic acid level of fresh semen. The correlations in diluted semen with the methylene-blue reduction time and the glucose loss, lactic acid gain, and livability after an hour's incubation at 46.5°, and by lactic acid gain and livability after 10 days' storage at 5° were equally significant. For routine prediction of semen quality there are recommended the methylene-blue reduction test with spermatozoa count and initial motility estimates.

**An acephalic lamb monster in sheep and its relation to single-egg twinning in sheep,** L. J. COLE and W. A. CRAFT. (Wis. Expt. Sta. coop. U. S. D. A.). (*Jour. Hered.*, 36 (1945), No. 1, pp. 29-32, illus. 2).—Observations were made on an embalmed headless lamb fetus twin to a normal ewe lamb of the Hampshire breed. The specimen lacked head and thorax and the organs normally contained in these structures. There was an abundance of adipose tissue beneath the skin, interspersed with strips of connective tissue and underlaid with a dense layer like deep fascia. Efforts to tease out the fibers were only partly successful, as they were too fragile. The skeleton was meager, and what may have represented an abortive spinal column was found in the form of cartilaginous tissue in the mass of muscle. Coils of intestines were found. Other organs were identified with difficulty. Substantial evidence indicated a rare case of single-egg twinning with chorionic fusion.

**Local maintenance of spermatogenesis by intratesticularly implanted pellets of testosterone in hypophysectomized rats,** S. DVOSKIN (*Amer. Jour. Anat.*, 75 (1944), No. 3, pp. 289-327, illus. 19).—Pellets, weighing 4-5 mg., of testosterone alone, or with cholesterol in varying proportions of 5, 10, 15, 20, 25, and 33 percent of testosterone, were implanted in the testes when rats were hypophysectomized at from 70 to 120 days of age. They were autopsied 20-40 days after implantation, and the testes and accessory glands were weighed individually. Much less testosterone was absorbed from the pellets than that ordinarily administered by injection in oil. An average of about 230 µg. of testosterone was absorbed per day from pure testosterone pellets. An average of 2.5 µg. was absorbed per day from the pellets containing 5 percent testosterone, with intermediate amounts for pellets containing varying proportions of testosterone. Intratesticular implants of pure testosterone completely or almost completely maintained spermatogenesis during the 20-day period, but the weights of the testes were not maintained. The

action of testosterone pellets was greater in the testis in which the implantation was made than in the contralateral testis.

**Segmental interchange in mice**, P. C. KOLLER (*Genetics*, 29 (1944), No. 3, pp. 247-263, illus. 5).—In three lines of mice from different males produced by irradiation with 600-900 r. (roentgens), there was an association of four chromosomes due to segmental interchange between two pairs of nonhomologous chromosomes. The approximate fertility in the three lines was 30-39, 46, and 51 percent. Differences in fertility were correlated with differences in the frequency of non-disjunctional coorientation of chromosomes in the ring-of-four. Estimates of fertility from cytological analysis were expected to be, in the different lines, about 24, 44, and 48 percent. Differential fertility in successive generations was attributed either to minor structural changes or gene mutations resulting from the radiation responsible for the segmental interchanges. Analyses are made of the various factors responsible for genetically balanced gametes. Inherited low fertility, common in domestic animals, may result from segmental interchange, the maintenance of which may be favored by artificial selection.

**Studies on an anophthalmic strain of mice**.—IV, A second major gene for anophthalmia, H. B. CHASE. (*Univ. Ill.*). (*Genetics*, 29 (1944), No. 3, pp. 264-269).—Additional evidence is presented that the anophthalmic strain of mice (E. S. R., 88, p. 319) is homozygous for one major recessive factor *ey-I*. A mutant female which had a normal left and medium right eye occurred in this strain. This character was designated as *Ey-2*. Among 522 F<sub>2</sub> animals, 88.7 percent had normal eyes. The new gene appears not to be an allele of the previously reported gene for anophthalmia, but rather an independent factor.

**Inheritance of polydactylism in the fowl**, D. C. WARREN. (*Kans. Expt. Sta.*). (*Genetics*, 29 (1944), No. 3, pp. 217-231, illus. 2).—Investigations were made of polydactyly in three strains—the usual five-toed group, a stock selected for polyphalangy which appears as a five-toed stock with the No. 1 toe missing, and the duplicate type (E. S. R., 85, p. 36). Each of the three stocks showed a distinctive incidence of various expressions of polydactylism. These variations in expression resulted from partial suppression of the condition due to environmental and hereditary factors. Low temperature during the early incubation period influenced the expression of the condition. Polydactylism is modified by varying combinations of three processes—the addition of a digit beside the No. 1 digit, the splitting of the added digit, and the loss of the normal No. 1 digit. Polyphalangy resulted from the action of an incompletely dominant modifier of the five-toed type. The ordinary polydactylism and duplicate were each dominant mutations, probably at the same locus. Minor modifying factors probably played a part. A considerable body of data on polydactylism was accumulated in connection with other genetic studies on the fowl. The variations of polydactylous stocks from different types of polydactyly were classified and the proportions among the offspring of different matings tabulated. Linkage relations between duplicate and other forms of polydactyly are presented and compared with data of Hutt and Mueller (E. S. R., 89, p. 200).

**Inheritance of ragged wing in the fowl**, F. B. HUTT, C. D. MUELLER, and D. C. WARREN. (*Cornell Univ. and Kans. State Col.*). (*Jour. Hered.*, 35 (1944), No. 1, pp. 27-32, illus. 2).—Independent genetic analysis showed that a ragged wing condition of the flight feathers of Single-Comb White Leghorn and Rhode Island Red fowls, which was not evident at hatching or even at 12 weeks excepting in a small proportion of the adult plumage, was inherited as an autosomal recessive. In most cases remiges were present but in others they were missing. In the most extreme form all the remiges may be eliminated from the adult plumage. The rectrices are unaffected. The ragged wing condition was present in

five flocks in New York State and three in Kansas. Practically equal numbers of ragged and normal offspring were produced in both States by crossbreds resulting from matings of ragged parents with normals.

Endocrine identification of the broody genotype of cocks, A. V. NALBANDOV and L. E. CARD. (Univ. Ill.). (*Jour. Hered.*, 36 (1945), No. 2, pp. 34-39, illus. 2).—In a preliminary trial, none of 12 Dark Cornish, Single-Comb White Leghorn, and White Plymouth Rock males were induced to build nests regardless of the breed. Each male was confined to a small coop in complete darkness with access to feed and water and at a temperature of 70°-80° F., with daily injection of 100 International Units of prolactin. In the second experiment, the nest of each male was filled with 12 eggs, but none of the males sat on them. Chicks were used in another experiment. The untreated males showed different responses to the egg, but none cared for the chicks without treatment with prolactin. Following daily treatments with this hormone, the chicks were gradually accepted. The males were found to cluck, "tidbit," and brood chicks, broodiness continuing as long as the prolactin was injected but disappearing when the injections ceased. The amount of prolactin required for broody response in males of different breeds varied, being 300 I. U. of prolactin for the Cornish males, 400 and 500 I. U. for two different White Plymouth Rock males, and 500 and 700 I. U. for different Single-Comb White Leghorn males, while 50 I. U. of prolactin was invariably sufficient to cause broodiness in a nonbroody hen of any breed. Untreated males invariably killed their brood or permitted it to die through neglect.

Observations on the structure of bone in estrogen-treated cocks and drakes, W. LANDAUER and B. ZONDEK. ([Conn.] Storrs Expt. Sta. et al.). (*Amer Jour. Pathol.*, 20 (1944), No. 1, pp. 179-209, illus. 21).—Observations on the long bones of cockerels and drakes treated in previous experiments (E. S. R., 85, p. 332) with estradiol benzoate showed that injection during 21 days with 5 mg. of this hormone three times a week into cockerels after 6 weeks of age produced diffuse increase in density in the shaft and epiphyseal ends of the femur. There was increased vascularization of the long bones, accompanied by removal of bone salts (osteolysis). The processes of halisteresis are followed by disappearance of fat from the marrow cavity, increased multiplication of marrow cells, and vasodilation in the marrow. Following large doses of estrogen, there was fibrous degeneration with focal necrosis, production of hyalin within and outside blood vessels, and eventually the formation of new endosteal bone. Skeletal changes in mallard drakes were slight, but very pronounced in Pekin drakes, with cocks holding an intermediate position. Similar effects were produced in mature cocks and fully grown capons. An extensive bibliography is included.

Naked pigeons, L. J. COLE and R. D. OWEN. (Wis. Expt. Sta.). (*Jour. Hered.*, 35 (1944), No. 1, pp. 2-7, illus. 4).—After considerable difficulty in reproduction, featherless pigeons were crossed with feathered pigeons by artificial insemination. From matings of an  $F_1$  female with one of her brothers, 32 fertile and 1 infertile eggs were laid, but only 17 hatched. There were 4 featherless and 13 normals in the  $F_2$ , which approximated the 3:1 ratio. Naked was non-sex-linked, and the symbol  $na$  was suggested. There was a conspicuously higher death rate among the females than the males. The nestling down of naked squabs was sparse, and short, pointed stubs appeared on most of the feather tracts. The feather follicles of the wings of these birds may not erupt, but a swelling is produced.

## FIELD CROPS

[New varieties of field crops] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. Rpt.*, 1944, pp. 8-13, 15-19, 22, 30; also in *U. S. Dept. Agr., Agr. Res.*

*Admin. Rpt., 1944, pp. 198-203, 205-209, 212, 220.*)—Crop varieties brought forward recently as results of improvement work largely in cooperation with State experiment stations include superior corn and popcorn hybrids; Wichita, Pawnee, and Big Club 43 wheat; Glacier barley; Fulltip dwarf broomcorn; Kalo Selection No. 617, Cache feterita, and Cody waxy sorghum; Crystal, Renew, and Arrow seed flax; S × P (Pima × Sakel), Acala 1517, and Empire cotton; Russian wild-rye grass (*Elymus junceus*); Lincoln bromegrass; Buffalo, Ranger, and Nemastan alfalfa; Climax annual lespedeza; Selection 1-i buffalo grass; a new variety of Kentucky bluegrass; Lincoln soybean; Potomac and Menominee potatoes; strains of Spanish peanuts; and C. P. 33/310 and C. P. 33/425 sugarcane. Outstanding characteristics of each variety are described.

[*Farm crops research in Mississippi*] (*Miss. Farm Res. [Mississippi Sta.], 8 (1945), Nos. 1, 2, 8; 2, pp. 1, 2, 8.*)—Findings in current experimentation with field crops are reported in articles entitled, in No. 1, Top Dress Oats With Nitrogen, by R. Coleman (pp. 1, 2); and Sources of Nitrogen for Oats in South Mississippi, by T. E. Ashley (pp. 1, 8); and, in No. 2, Delta Study on Soybean Planting Methods Indicates Crop Suitable to Mechanization (coop. U. S. D. A.) (pp. 1, 8); Sweetpotato Propagation Problems, by W. S. Anderson (p. 2); and Commercial Nitrogen for Cotton, Stoneville (p. 8), and Commercial Nitrogen for Corn, Stoneville (p. 8), both by J. Pitner.

Results of 1944 official variety tests in North Carolina, R. P. MOORE (*North Carolina Sta. Agron. Inform. Cir. 136 (1945)*, pp. [11]).—Yields of varieties and strains of wheat, oats, and barley, in tests on farms in different parts of the State are reported for 1944, averages are given for 2 yr. or longer, and commercially available entries are described briefly.

Cropping for profit and permanency, W. E. BOWSER and A. G. McCALLA (*Alberta Univ., Col. Agr. Bul. 44 (1944)*, pp. 46, illus. 9).—Cropping practices and rotations are recommended for the brown soil, dark brown and shallow black soil, black and gray-black soil, and the gray wooded soil climatic zones in Alberta.

Range and pasture studies and grazing recommendations for the southern Great Plains, W. N. McMILLEN and Q. WILLIAMS. (Coop. U. S. D. A.). [*Oklahoma Panhandle Sta., Panhandle Bul. 67 (1944)*, pp. 47, illus. 18].—Report is made on studies (1939-43) on seasonal changes in chemical composition and yields of pasture vegetation, variations in density, pasture yields and grazing data, yield and density of native grass under irrigation, and use of temporary pastures. Re-vegetation and pasture practices recently advanced by other workers and by ranch and farm operators in this general vicinity are discussed, together with recommendations for supplemental feeding of livestock on pasture. Characteristics, value, and use of some of the more important permanent and temporary pasture grasses and crops are discussed, with mention of some experimental grazing results with weeping lovegrass, little barley, and wheat pasture.

Density and volume of production of buffalo grass were apparently unaffected by clipping often, while frequent and severe clipping thinned the stand of blue grama, weakened the plants, and decidedly decreased the volume of production. Density of buffalo grass increased greatly above terrace ridges. Western wheat-grass was ready for grazing early in the spring and was an excellent source of important feed nutrients if kept grazed rather closely.

The moisture, protein, P, and carotene contents of blue grama, buffalo grass, and Russian-thistle fell rapidly as plants approached maturity, except P in Russian-thistle. Ca was quite variable throughout the season. Protein, Ca, and P contents of buffalo grass were appreciably higher than those of blue grama during winter. Clipping increased the nutrients in blue grama but had little effect on com-

position of buffalo grass. Over 5 yr., frequent clipping of the two grasses produced a larger acre yield of dry matter, protein, carotene, ash, Ca, and P than clipping less often.

Yearling steers and heifers grazing the experimental pasture for an average of 130 days for five seasons made an average daily gain of 1.19 lb. and a yearly average of 32.1 lb. of beef per acre. Daily gain averaged 1.47 lb. for June and 0.73 lb. for August. When herbage contained 13 to 25 percent crude protein (dry basis) and 10 to 37 mg. of carotene in June, gains were high. As the protein dropped to 6 to 8 percent and the carotene to 3 to 6 mg. in August, average live-stock gains were correspondingly low.

Irrigation postponed lignification of buffalo grass, which had more protein and carotene August 30 and October 4, 1941, than dry-land grass. Buffalo grass, making remarkable increase in density under irrigation, more than tripled in density in 5 mo. during 1939. Indications were that irrigated grass would yield 2.5 to 4 times more than dry-land grass. In 1943 irrigated buffalo grass produced 161.2 lb. of beef per acre and native dry-land pasture 39.4 lb. While irrigation increased grass yield, cattle tended to overgraze some areas and leave other areas ungrazed.

Alfalfa seed production as affected by organic reserves, air temperature, humidity, and soil moisture, C. O. GRANDFIELD. (U. S. D. A. and Kans. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 70 (1945), No. 4, pp. 123-132, illus. 1).—The optimum temperature for the setting of alfalfa seed pods at Manhattan, Kans., was 80° F., the number declining above 100°. As the relative humidity decreased from 90 to 10 percent the number of flower setting pods rose. At 80° the percentage of flowers setting pods was 38 at 90 percent relative humidity and 62 at 10 percent. High organic reserves in the roots increased seed production, the greatest increase occurring when moisture was low. When the reserves were low, seed production was greater when the soil moisture was high. Moderate air temperature, low humidity, and soil moisture below optimum produced the type of vegetative growth of alfalfa plants conducive to storage of high organic reserves, resulting in a physiological condition favorable to seed setting.

Yields of barley varieties in the United States and Canada, 1937-41, G. A. WIEDE, P. R. COWAN, and L. REINBACH-WELCH (*U. S. Dept. Agr., Tech. Bul. 881* (1944), pp. 83, illus. 1).—Acre yields of barley varieties determined in comparison with a standard variety on the testing fields of 114 experiment stations and substations in the United States and 24 in Canada are again (E. S. R., 85, p. 44) reported. Tables show the highest yielding varieties 1937-41 at each station; the season when the tests were sown, number of replications, and type and size of plot for yield tests; and descriptions of the varieties tested and their origins or sources.

Maturity ratings of corn hybrids registered for sale in Minnesota in 1944, R. F. CRIM, H. K. HAYES, E. H. RINKE, R. E. HODGSON, R. O. BRIDGFORD, and R. S. DUNHAM (*Minnesota Sta. Bul. 383* (1945), pp. 19, illus. 1).—Variety names, maturity classes, average moisture percentages, and maturity ratings in days are reported for many hybrids grown on trial plots in 1944 in the zones in which they were registered for sale, and in a number of instances in 1942 and 1943 (E. S. R., 90, p. 474), in comparison with certain adapted Minhybrids in each of the five corn maturity zones of Minnesota.

The 1944 Virginia corn performance test, M. H. McVICKAR (*Virginia Sta. Bul. 365* (1944), pp. 8, illus. 1).—Acre yields and other agronomic characters are reported for corn hybrids and varieties grown in performance tests (E. S. R., 91, p. 408) at 13 places in Virginia in 1944. Hybrids are recommended for each of 7 general sections of the State. At present, local-adapted varieties instead of hybrids are indicated for elevations above 2,500 ft.

The current cotton research program in production and related fields, January 1945, F. J. WELCH (*Mississippi Sta. [1945]*, pp 103+).—Included are statements of the titles and objectives of the current active projects on Federal, State, and private funds classified as follows: "(1) Breeding, genetics, and improvement of varieties; (2) cotton variety testing work and geographic distribution of varieties; (3) the genetic, technical, and economic aspects of cottonseed production; (4) soil fertility and the use of fertilizer in cotton production; (5) cotton disease control and seed treatment for better germination of improved varieties; (6) cotton insect and pest control; (7) cultural methods and mechanical operations; (8) general farm management problems and practices and marketing and distribution problems; (9) ginning and other preparations for the market; (10) cotton fiber analysis in relation to cotton utility as a basis for breeding and production, for improvement of ginning, for better and extended utilization, and for standardization and classification; (11) foreign competition and demand; (12) domestic price policies and programs."

The place of crested wheat grass in controlling perennial weeds, T. K. PAVLYCHENKO (*Sci. Agr.*, 22 (1942), No. 7, pp. 459-460, illus. 5; also in *Saskatchewan Univ., Col. Agr. Ext. Bul.* 109 [1944], pp. [4], illus. 5).—Crested wheat-grass has completely smothered thick stands of perennial sowthistle and toad flax in three seasons at Saskatoon and has practically eliminated a solid stand of Canada thistle in four seasons with only a few suppressed weeds surviving in a depression where the soil contained more alkali salts. At the end of the fifth year the grass stand was entirely free of weeds. Fall-sown into a solid stand of quackgrass after the top growth had been mowed closely and the surface harrowed, crested wheat-grass nearly exterminated the weed in 4 yr. Leafy spurge, poverty weed, field bindweed, and hoary cress, after 4 yr. of competition with crested wheatgrass, were so reduced in size that a hay crop cut from the plats was reasonably weed free.

Comparative studies of several potato seed treatments, E. V. HARDENBURG. (Cornell Univ.). (*Amer. Potato Jour.*, 22 (1945), No. 1, pp. 1-5).—When seed potatoes were dusted with three commercial root hormones in tests 1943-44, no increases in yield resulted. One retarded emergence, reduced the stand, and appeared toxic to sprout growth. A commercial mixture of trace elements at rates of 50 and 100 lb. per acre in the row and separate from the regular fertilizer application showed no benefits on Allis gravelly loam, a relatively infertile, highly acid soil. In a comparison of cut seed dusted with ground limestone, cured seed, green sprouted seed, and freshly cut untreated seed, no significant difference in stand of plants resulted. Green sprouted seed emerged first, grew fastest early in the season and gave the highest total yield, yet results were not statistically better than those from the other treatments.

Results of the cooperative uniform soybean tests.—I, North Central States, 1943, W. J. MORSE, J. L. CARTTER, C. R. WEBER, L. F. WILLIAMS, A. H. PROBST, M. A. ARNESON, D. HEUSINKVELD, ET AL. (Coop. 12 State expt. stas.). (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., RSLM* 109 (1944), pp. 85+, illus. 1).—Detailed results of the uniform variety tests, maturity groups I-IV, conducted in 1943 in cooperation with 12 experiment stations in the North Central region are set forth in tables showing yield, lodging, height, maturity, seed quality and weight, percentages of oil and protein and iodine number of oil, and also the 2- and 4-yr. summaries of agronomic and chemical information for the different strains grown during 1940-43. Precision of experimental designs and effects of location on composition are also discussed.

Results of the cooperative uniform soybean tests, 1943.—II, Southern States, W. J. MORSE, J. L. CARTTER, P. R. HENSON, R. B. CARR, ET AL. (Coop. 12 State

expt. stas.). (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., RSLM* 122 (1944), pp. 119+, illus. 1).—Average agronomic and chemical results of the uniform variety tests, groups IV to VI, and dates of planting tests for the 1943 season made in cooperation with 12 experiment stations in the Southern States are reported.

The early development and rate of nutrient uptake by sugar cane, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 48 (1944), No. 1, pp. 43-57, illus. 7).—Rates of development and NPK composition of below- and above-ground portions of H 109 sugarcane started in different seasons were determined from periodic harvests of pot cultures during the first 12 mo. of growth. Concentration of N, P, and K decreased as plants grew older. Rates of dry matter production were quite similar, except for the crop planted in August. Apparently winter weather influenced this planting at the age when it should have been doubling its weight. The most rapid N uptake occurred between appearance of the eighteenth and thirtieth leaves—about from 4' to 9 mo. Winter weather during this growth period decreased the rate of N absorption. P absorption was quite constant after the crop was well under way. In the early stages, K was taken up rapidly, but about midway in growth, an actual K loss from the plant tissues took place.

Nitrogen efficiency, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 48 (1944), No. 3, pp. 197-202, illus. 1).—*Panicum barbinode* had a more complete N uptake and made greater yields following N applied in May and August than from similar amounts applied in February or November. Inferentially a crop of sugarcane should obtain higher efficiency (E. S. R., 92 p. 204) from summer than from spring N applications. Presumably it would take an application of about 70 lb. in winter, or of 60 lb. in spring, to result in an equivalent N recovery by the crop from only N 50 lb. applied in summer or fall.

Our field testing program, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 48 (1944), No. 1, pp. 1-6).—The scope of and progress results obtained in cooperative replicated field tests with sugarcane are discussed, and special reference is made to methods of plowing, widths of rows for new varieties, weed control, subsurface fertilization, alternate row cultivation, N needs of varieties, and the merits of growing of plant cane only v. plant cane plus ratoons.

A continuous supply of fresh sweetpotatoes for table use on the farm, C. L. ISBELL (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 391-395, illus. 7).—That the average southern farmer can provide a continuous supply of fresh sweetpotatoes for table use throughout the year was shown by planting, harvesting, and storage experiments reported. The program indicated includes planting early and harvesting small quantities of the largest roots for current use during summer and early fall; and harvesting in fall before frost while the weather is warm and the soil is dry, and storing just after harvest in ventilated or sheltered banks with enough earth or other cover to avoid chilling during the coldest weather. This will provide sweetpotatoes for fall, winter, and early spring. When dormancy is over in late winter or early spring, the sweetpotatoes are removed from the bank, put in a dry place, and chilling on cold nights prevented. Re-stored potatoes that remain sound provide a supply from late winter or early spring until the new crop is ready for use in midsummer.

Experiments on the leaf-burn of tobacco, J. JOHNSON, W. B. OGDEN, and O. J. ARTOE (*Wisconsin Sta. Res. Bul.* 153 (1944), pp. 75+, illus. 9).—Improvement of the leaf burn of Wisconsin-grown tobacco is a major problem confronting growers as well as local leaf dealers supplying manufacturers of cigars. The results of the more detailed and technical aspects of leaf burn in research during the past

15 yr. are reported and compared with investigations of others. Results here presented are also integrated with those already published from the station on fertilizer experiments (E. S. R., 87, p. 218; 90, p. 620; 91, p. 33), a tobacco soil survey (E. S. R., 87, p. 184), and on cigar burn (E. S. R., 86, p. 437). The previous results, together with the new data involving about 2,500 samples of tobacco and 150,000 individual burn tests, serve as the basis for the chief conclusions. Previous experiments at the station showed that about 5 sec is the minimum leaf burn that can be tolerated in fermented cigar-binder leaf, with improvement in cigar burn continuing up to about 20 sec. This is equivalent to about 3 sec. and 10 sec. in unfermented leaf, the processing stage to which most of the data presented apply. Leaf burn records, as given, are an average of counted seconds from 60 trials distributed over 10 or 20 leaves chosen at random from representative samples.

An average of 1,122 samples (1930-43) shows that leaf burn at the leaf tip is about twice that at the leaf base, and that at the leaf middle is about the average of tip and base areas. Leaf burn of lower leaves on the plant is normally considerably higher than that of upper leaves, and middle leaves are fairly intermediate between the lower and upper leaf positions. Varietal differences in leaf burn are not significant; and degree of maturity, curing conditions, and aging in storage have little or no consistent influence. While fermentation, on the average, doubles leaf burn of tobacco, response of different crops to this process is very variable. The data show a range of variation after fermentation from a decrease of leaf burn to an improvement up to 1,200 percent. When leaf burn is 0 to 1 sec, because of low K or high Cl in the unfermented stage, little or no improvement occurs in fermentation. Highest increases in leaf burn apparently result when the K content of the leaf is high and the organic N content is low and in a form easily broken down to simpler forms by fermentation.

Seasons of low rainfall and high temperatures are harmful to development of satisfactory leaf burn, and opposite conditions favor high leaf burn. Effects of the season on leaf burn vary greatly with the potential power of the soil to produce a tobacco of satisfactory leaf burn.

The soil, the most important factor in determining leaf burn of tobacco, supplies or regulates the principal elements assimilated by the plant which affect this character. K, the most critical element as regards leaf burn, is required in "luxury" amounts up to 6 percent in the leaf in order to develop good leaf burn, although as little as 2 percent may suffice for normal plant growth. High percentages of clay or colloids in the soil lower leaf burn evidently because of reduced availability of K to the plant. Cl, not necessary for growth, is present in all fertilized soils in varying amounts and may commonly be found in the tobacco leaf up to 1 or 2 percent. Presence of more than 0.50 percent of Cl is regarded as harmful to leaf burn.

Effects of K and Cl and other elements and substances on leaf burn are illustrated by correlation tables based on leaf and soil analysis, and by impregnation of tobacco leaf tissue and filter paper with representative salts. Correlations based on farm crops are not high because of the several inhibiting or interfering factors involved under practical conditions of culture. Much of the poor leaf burn of tobacco in Wisconsin appears to be associated with high Cl content of farm manures and with high Ca and Mg content in the more alkaline soils. The Cl is believed to be combined with the Ca or Mg in the growing plant or during combustion of the leaf, forming  $\text{CaCl}_2$  or  $\text{MgCl}_2$ , both of which tend to fuse or char, preventing or reducing the glowing capacity of the leaf tissue.

On soils unfavorable to leaf burn at the outset, improvement is not normally to be expected from any single fertilizer or other treatment. A suggestion for

improvement of leaf burn on such soils involves preparing the land for tobacco 2 or 3 yr. before planting this crop; the principle involved is based on raising the available K content of the soil quickly with high applications of manure and  $K_2SO_4$ , and then allowing a year or more for the thorough distribution of this K in the soil and simultaneous reduction of added Cl, prior to planting tobacco. During years when tobacco is grown on the land, less manure may be applied, but it should be supplemented with commercial fertilizer high in K.

The bibliography embraces 123 titles.

**Yields of winter wheat 1943-44.** G. H. DUNGAN and O. T. BONNETT (*Illinois Sta. Cir.* 588 (1945), pp. 4).—Varietal recommendations, based on yields, resistance to lodging and diseases, and grain quality include Marmin and Wisconsin 2 for north-central and northern Illinois; Tenmarq, Brill, Pawnee, and Wisconsin 2, hard wheats for mosaic-free land in central Illinois; Prairie, Wabash, and Fairfield, soft wheats for mosaic-infested land in south-central Illinois; and Fulcaster, Wabash, Prairie, Fairfield, and Fullio, soft wheats for southern Illinois. Tables show comparative behaviors of old and new varieties in 1943-44 tests and performance of these varieties previous to 1943-44 in comparison with all other varieties grown in the same years.

**Testing and quality of seeds for farm and garden.** R. H. PORTER. (Coop. U. S. D. A.). (*Iowa Sta. Recs. Bul.* 334 (1944), pp. 493-586, illus. 44).—Factors and conditions affecting seed quality, including crop sequence, cultivation, climate, time of harvest, genetic constitution, variety, storage, age, and seed treatment, are discussed; methods used in seed laboratories to determine seed quality are outlined; and the way the results of laboratory tests may be applied in planting seeds is illustrated. A digest of the Iowa seed law is included with features of the Federal seed act of 1939. Methods are also given for determining seed-borne disease-producing organisms, with a list of those often found on common field crops and vegetables.

**Chemical control of hardy weed grasses.** R. E. HANCE (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], 48 (1944), No. 3, pp. 193-196, illus. 1).—A discussion of current research.

**Weed-spray studies, [I], II.** R. J. BORDEN (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], 48 (1944), Nos. 1, pp. 21-29, illus. 7; 3, pp. 187-191, illus. 3).—Photographs show the response of goosegrass (*Eleusine indica*) to sprays of different dilutions of "Conc. 40" at several growth stages in sunlight and under shade and with ample and inadequate soil moisture in part 1.

In further tests with "Conc. 40" on goosegrass and *Digitaria* spp., noted in part 2, effects from sprays were definite and quite rapid (less than 24 hr.), especially with 1:20 dilution and on the younger weed growth. Respective kills by the 1:40 solution were 64 and 45 percent on 6 weeks' growth, 70 and 80 on 4 weeks' growth, and 75 and 96 on 2-week-old grasses, while kills by the 1:20 solution were 100 percent at all three growth stages in both grasses. Early spraying has given the best control and used least material.

## HORTICULTURE

[**Horticulture in the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. Rpt.*, 1944, pp. 6-7, 20-21, 22, 23-24; also in *U. S. Dept. Agr., Res. Admin. Rpt.*, 1944, pp. 196-197, 210-211, 212, 213-214).—In this general administrative report there are included reports on the following horticultural activities: Effect of placement of fertilizer on yield of vegetables; the origination of a hybrid onion, California Hybrid Red No. 1 (coop. Calif. Expt. Sta.); a new red-stole resistant strawberry, Temple (coop. Md. Sta.); two new

cabbages, Huguenot and Madison, and a disease-resistant snap bean, Logan (coop. 13 southern stas.); a bush-type pumpkin, Cheyenne Bush; a new slow-bolting lettuce, Great Lakes (coop. Mich. Sta.); an early-ripening yellow-fleshed peach, Dixigem; cold storage of vegetables for dehydration; and the development of a gaseous (aerosol) method of applying hormones to tomato flowers.

Tests conducted in Mesa County on bean cutworm, potatoes, and peach production, A. M. BINKLEY (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 1, pp. 14-15).—Brief information is presented on bean cutworm control, potato and peach fertilizers, virus diseases of peaches, peach marketing, etc.

**Spray chemicals and application equipment:** A text book and hand book of the insecticide-fungicide industry and of application equipment, J. A. MCCLINTOCK and W. B. FISHER (*Chicago: Greenlee Co.*, 1945, pp. 320; over 300 illus.).

The limitations of spraying tomatoes in Wisconsin, J. C. WALKER, O. C. WHIPPLE, J. P. JOLIVETTE, and W. J. HOOKER (*Wisconsin Sta. Res. Bul. 152 (1944)*, pp. 23+, illus. 7).—Results obtained over a period of years at several locations in southeastern Wisconsin were conclusive in showing that in this area economical increases in yield are rarely attained from spraying tomatoes with a view to reducing defoliation diseases. Tests of various insoluble copper compounds showed no significant differences between them with respect to yield or quality. As a class, the insoluble coppers were less injurious than bordeaux mixture.

Nutritional status of the plants was shown to be a factor in defoliation. In the case of well-nourished plants the benefits from protective sprays diminish, and conversely the most striking results of spraying were obtained on plants growing in soil of low fertility. In fact much greater increase in quality at the cannery was obtained by raising fertility than by application of fungicides. Apparently an uninterrupted and unretarded rate of production of fruit is essential to an economically successful crop both as to yield and quality.

**Tomato variety test, Delta Station, 1943-44,** L. R. FARISH (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 1, pp. 1, 8).—Tests of tomato varieties conducted at the Delta Branch Station in 1943 and 1944 showed marked differences in yield and resistance to fusarium wilt and other diseases.

New fruit varieties tested for value and adaptability at fruit substation at Austin, F. M. GREEN (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 1, pp. 3-9, illus. 2).—Pointing out the need of new varieties of fruit, the author describes a number of peaches, apricots, and plums that possess desirable qualities.

**Orchard spraying and dusting,** C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 2, pp. 1, 7).—Information is presented on the need of protecting orchards from various pests, and schedules are presented for the peach and plum and for the apple and pear.

**The relation between maturity and quality in the peach,** R. V. LOIT. (Univ. Ill.). (*Amer. Pomol. Soc. Proc.*, 59 (1943), pp. 107-112).—Peaches harvested at Murphysboro, Ill., in three stages of maturity, namely, green immature, hard medium mature, and firm mature, were shipped to Champaign, Ill., for study. The fruit harvested green never reached a quality suitable for eating or for canning. The fruit harvested in the hard medium mature stage reached finally a quality suitable for canning, but never was satisfactory for eating fresh. The third, the firm mature lot, was suitable for all general uses. Analyses showed the last group to have more total sugar and less acid at harvest. Ultimate quality was thus determined largely at the time of harvest. Some further observations on Halehaven peaches harvested at different stages of maturity showed also the rapid increase in sugars in the final days on the tree.

The Shasta, Sierra, Lassen, Tahoe, and Donner strawberries, H. E. THOMAS and E. V. GOLDSMITH (*California Sta. Bul.* 690 (1945), pp. 12, illus. 2).—Five new strawberry varieties adapted for trial in northern and central California as fresh market berries are described and named. All produce in the fall in the central coast region and one, the Sierra, is adapted to the foothill and interior valley districts. Selections with *Fragaria chiloensis* parentage, having resistance to the virus disease yellows and crossed with varieties or selections having good dessert quality, were used as basic parents from which the five new varieties were derived. The variety Nich Ohmer was the principal parent from which fall production was obtained. The adaptation, origin, and characterization for each of the five varieties and the technical description of the fruit are given. Varying degrees of resistance to yellows are shown by Shasta, Lassen, Sierra, and Tahoe; to verticillium wilt by Shasta and Tahoe; and to powdery mildew by Shasta and Donner.

Suggestions for the use of growth substances in the vegetative propagation of tropical plants, W. C. COOPER and V. T. STOUTEMYER. (U. S. D. A.). (*Trop. Agr. [Trinidad]*, 22 (1945), No. 2, pp. 21-31).—This informative paper (82 references)—presented for the benefit of those investigating various phases of the subject—considers such matters as the selection of cutting material, propagation facilities, methods of applying growth substances, the relative efficacy and effects of different materials, supplementary treatments, and the practical employment of the method in root and leaf-bud cuttings, marcottage (air layerage), healing of wounds, grafting and budding, and other horticultural applications.

Effect of potassium deficiency and of potassium derived from different sources on the composition of the juice of Valencia oranges, W. R. ROY. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 5, pp. 143-169, illus. 8).—A biochemical study was made of the juice from Valencia oranges grown with varying amounts and sources of potash in the fertilizer, ranging from none to twice the customary levels of application. The effect of lack of potash was reflected in the orange juice by an increased concentration of reducing and total sugars, and an increase in the ratio of reducing to nonreducing sugars, together with a decrease in the ascorbic acid, citric acid, buffer index, pH, ash, potassium, and alkalinity of the ash, when compared with juice from oranges grown on trees receiving adequate amounts of the element in the fertilizer. No differences were noted which could be attributed to the source of the potash, whether from muriate, sulfate, or sulfate of potash-magnesia. Results indicated that "medium" levels of application (1.7 to 2.3 lb. of potash per tree per year) were sufficient to produce fruit of good quality, and that "high" levels of application (2.7 to 3.6 lb. per tree per year) were unnecessary from an economic standpoint. Withholding of potash from orange trees produces less fruit, smaller in size, which matures from 2 to 3 weeks earlier.

Home production of Dahlias, F. S. BATSON (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 2, p. 7, illus. 3).—General information is offered on propagation, culture, storing of roots, varieties, etc.

Producing gladiolus for the home, F. S. BATSON (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 1, pp. 1, 8, illus. 1).—This contains general information on propagation, culture, care of corms, control of pests, varieties, etc.

## FORESTRY

Root growth of jack pine on several sites in the Cloquet Forest, Minnesota, C. M. KAUFMAN. (N. C. State Col.). (*Ecology*, 26 (1945), No. 1, pp. 10-23, illus. 5).—The course of seasonal root growth and the air and soil temperature, soil moisture, precipitation, and evaporation were measured in several stands in 1939, 1940, and 1942. For trees 25-28 yr. old, growth of individual roots averaged 9-12 in. per

season; for 7-year-old trees growing under favorable conditions the average was nearly 15 in. The roots grew from April to October, but were completely dormant during winter. Growth was resumed in the spring after the temperature of the upper 6 in. of soil rose above 40° F., but was limited until 50° was attained; favorable temperatures occurred earliest in a young stand on bare mineral soil and latest in stands with a closed canopy and several inches of litter and mull. A drop in soil temperature to less than 45° for 6 days near the end of September caused root growth to cease; in the absence of such a drop growth continued into October. A reduction in the rate of root growth during July-August in stands 25-28 yr. old was concurrent with a drop in the level of available moisture to less than 4 percent and a high rate of evaporation. A midsummer reduction in rate of root growth in a 7-year-old stand was coincident with a fall in available moisture to less than 4 percent, but there was no evidence of marked variation in the evaporation rate. Root and leader growth started within a week of each other in spring; leader growth, however, was nearly completed by the end of June when less than 50 percent of the seasonal root growth had been made.

**Experimental forest planting,** L. W. BRYAN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 48 (1944), No. 3, pp. 179-181, illus. 1).—Plantings of introduced species established in 1909-10 were examined in 1944 and many of the coniferous species were found to have made highly satisfactory growth. Of the original hardwoods, only one, *Eucalyptus robusta*, survived. Apparently the hardwoods were planted too high on the mountain, for later plantings at lower elevations have been successful.

## DISEASES OF PLANTS

Some results of value to States from the Emergency Plant Disease Prevention program in 1943 and 1944, H. P. BARSS (*U. S. Dept. Agr., Off. Expt. Stas. [1945]*, pp. 12+).—This is a digest of the replies received from a questionnaire sent to the head of plant pathology work at each State agricultural experiment station. It presents (1) examples of plant diseases or plant disease situations—previously unrecognized or passed over in the individual States—which have been brought to light in connection with the Emergency Plant Disease Prevention program; (2) instances where farmer education, control programs, or forecasting and warning services on particular diseases were definitely accelerated or aided by information from this program; and (3) examples of new research efforts or redirection of current research emphasis resulting from information thus brought out. Under these three main categories the items are arranged by regions of the United States and under each region by crops or crop groups.

Some recent results of experiment station research on plant disease control in the United States exclusive of work on the newer synthetic organic fungicides, H. P. BARSS and F. V. RAND (*U. S. Dept. Agr., Off. Expt. Stas., 1944*, pp. 7+).—This mimeographed report presents a summary of some recent results by the State agricultural experiments stations on work with fungicides exclusive of the newer synthetic organics and on other means of reducing crop disease losses. The material included is based largely on reports of progress in research projects received by the Office of Experiment Stations during the fiscal year 1943-44 and on journal articles and bulletins published during that period; it is supplementary to material on the synthetic organics presented in the Report on the Agricultural Experiment Stations, 1944 (E. S. R., 92, p. 870).

**The Plant Disease Reporter, [February 1, 7, 15, and 22, 1945]** (*U. S. Dept. Agr., Plant Disease Rep., 29 (1945)*, Nos. 3, pp. 67-96, illus. 1; 4, pp. 97-129; 5, pp. 131-160, illus. 2; 6, pp. 161-183, illus. 1).—In addition to brief seasonal survey notes

from the Emergency Plant Disease Prevention Project relating to such crops as vegetables in general, in greenhouses and cold frames, and in winter truck areas; potatoes in storage; greenhouse ornamentals; and miscellaneous plants, the above issues contain the following signed notes and articles:

No. 3.—Host-disease check list revision—*Dactylis-Eleusine* (Gramineac) and *Eleocharis* (Cyperaceae), by F. Weiss; observations on grass diseases in Kentucky, September 1942—September 1944, and a preliminary check list, by J. R. Hardison; ergot of Dallis grass in California, by W. W. Mackie and W. C. Snyder; mosaic of wheat and a new mosaic chlorosis of oats in the Carolinas, by R. E. Atkinson; additional hosts of *Diaporthe sojae*, by E. S. Luttrell; storage diseases of fruits and vegetables in New York, by R. C. Cassell; studies on the control of onion smut by seed treatments in Oregon, by P. W. Miller and F. P. McWhorter; and isolations of *Vorticillium* from trees and shrubs in Illinois, 1940–44, by J. C. Carter.

No. 4.—Crown gall of hops (2,958 inoculations made with cultures of the crown gall organism obtained from hops on 210 species of plants in 94 genera and 48 families—data tabulated, galls resulting on 157 species in 71 genera and 37 families), by G. R. Hoerner (coop. Oreg. Expt. Sta.); fungi associated with decline of avocado and citrus (data tabulated) in California, III, by J. V. Harvey (E. S. R., 42, p. 515); surveys for western X-disease in Utah peach orchards, by A. S. Rhoads; pithy cherry disease of sour cherry in New York, by E. M. Hildebrand; diseases of fruits and vegetables in storage in New York, by R. C. Cassell; storage diseases of potatoes and other vegetables in Minnesota, by I. W. Tervet; storage diseases of potatoes and onions in Iowa, by E. F. Vestal; potato storage diseases in Wisconsin, by E. E. Honey; potato storage diseases in Ohio and California; water rot of potatoes, by E. C. Blodgett; does the Sequoia variety of potato possess resistance to leaf roll virus and to frost? by G. K. Parris; and *Macrophomina phaseoli* canker of cowpea and leaf spot of cowpea and snap bean, by J. L. Weimer and E. S. Luttrell.

No. 5.—Host-disease check list revision—*Elymus-Euchlaena* (Gramineae) and *Eriophorum* (Cyperaceae), by F. Weiss; preemergence damping-off control in guayule with phenyl mercuric fungicides, by B. Sleeth; noninfectious mosaic pattern of tomato, by J. T. Middleton; the seasonal spread and development of currubit downy mildew in Atlantic Coastal States in 1944, by C. J. Nusbaum; bean diseases in some of the Intermountain States in 1944, by W. J. Zaumeyer; potato storage diseases in central Washington and Oregon, by L. W. Boyle and E. C. Blodgett; storage diseases of sweetpotato; and spinach diseases in Texas, by G. E. Altstatt.

No. 6.—Defoliation and crop loss, by K. S. Chester; greenhouse and cold frame vegetable diseases in northern New Jersey, by A. J. Mix; spinach diseases and pests in Arkansas, by H. W. Larsh and J. R. Shay; apple storage in Delaware and Maryland, by A. J. Mix; and summary of the more important plant diseases taken in connection with the insect and plant disease survey in the general vicinity of ports of entry from July 1944 to December 31, 1944, compiled by W. S. Fields.

**Design for constant-temperature tanks**, W. A. CAMPBELL and J. T. PRESLEY. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 3, pp. 213–216, illus. 2).—A detailed description and drawings are presented for constructing tanks used for growing plants in soil maintained at constant temperatures within limits of  $\pm 1^{\circ}$  F. An electrically heated and thermostatically controlled series provides temperatures of  $70^{\circ}$ – $100^{\circ}$ ; another series—cooled by mechanical refrigeration—provides temperatures of  $40^{\circ}$ – $65^{\circ}$ .

**An improved type of precision dendrometer**, R. F. DAUBENMIRE. (Univ. Moho). (*Ecology*, 26 (1945), No. 1, pp. 97–98, illus. 1).

**Virus studies: Biophysical methods.** M. A. LAUTER (In *Medical Physics*, edited by O. GLASSER. Chicago: Year Book Pubs., 1944, pp. 1653-1658, illus. 1).—On the technics of virus research (many literature references), with special emphasis on ultrafiltration—standardization of a membrane, determining particle size, and application; centrifugation—in virus purification and determining the size, density, and degree of homogeneity of viruses; diffusion—in determining size of viruses; electrophoresis; electron microscopy; and special methods applicable to some viruses—viscosity, stream double refraction, X-ray diffraction, and high pressure.

**Plant viruses.** K. M. SMITH (*Endeavour [London]*, 4 (1945), No. 13, pp. 22-28, illus. 12)—A brief semipopular review of the present status of knowledge on the viruses of plant diseases, including some of the symptoms, immunity relations of virus strains, the size and shape of plant viruses, their transmission, and some unusual viruses. Ten of the illustrations are in color.

**Studies on a fluorescent substance present in plants.—II, Isolation of the substance in a pure state and its identification as 6-methoxy-7-hydroxy 1:2 benzo-pyrone.** R. J. BEST (*Austral. Jour. Expt. Biol. and Med. Sci.*, 22 (1944), No. 4, pp. 251-255, illus. 2).—The fluorescent substance previously described<sup>3</sup> as being produced in unusually large amounts in certain plants as a result of virus activity has now been isolated in the form of pure crystals; it can be extracted from acidified aqueous solutions by chloroform and from its solution in chloroform by weakly alkaline (around pH 10) aqueous solutions. A method is described for obtaining the substance from young decapitated tobacco plants after inoculating them with the tomato spotted wilt virus and allowing the substance to accumulate in the roots. The average amount recovered in pure crystalline form from such plants was of the order of 0.1 mg. per plant; older larger plants yielded more. Healthy plants gave smaller yields of the same substance, which was shown to be 6-methoxy-7-hydroxy 1:2 benzo-pyrone (Scopoletin). The ultraviolet absorption spectrum exhibited two maxima, one at  $\lambda$ 2,285 a. u., log E 4.25 and another at  $\lambda$ 3,435 a. u., log E 4.14. The possible mode of action of the substance on the virus in the plant is discussed.

**Notes on the pathogenicity of *Myrothecium roridum* Tode ex Fr.** F. T. BROOKS (*Brit. Mycol. Soc. Trans.*, 27 (1945), pt. 3-4, pp. 155-157).—Isolates from different hosts were found to vary in pathogenicity; for example, one from potato appeared to be entirely nonpathogenic to the plants experimented with, an isolate from *Antirrhinum* was pathogenic to a wider range of hosts than any hitherto recorded, and one from *Lupinus ornatus* seemed to be somewhat more pathogenic to tomato than the one from *Antirrhinum*.

**Some observations on powdery mildews.** W. A. R. DILLON WESTON and R. E. TAYLOR (*Brit. Mycol. Soc. Trans.*, 27 (1945), pt. 3-4, pp. 119-120, illus. 4).—On the bases of published studies on various powdery mildews by other workers and on circumstantial evidence presented by the author with respect to *Podosphaera oxyacanthae* on hawthorn, *Sphaerotheca pannosa* on rose, and *S. mors-uvae* on gooseberry, it is believed that the three fungi named may be able to perennialize in the bud.

**Hongos uredinales que atacan a nuestros cultivos [Rust fungi attacking Chilean crops].** S. ARENTSEN S. ([Chile] *Agr. Téc.*, 4 (1944), No. 1, pp. 54-56).

**Ustilago striaeformis.—III, A further study of factors that influence after-ripening of chlamydospores from *Poa pratensis*.** K. W. KREITLOW. (U. S. D. A et al.). (*Phytopathology*, 35 (1945), No. 3, pp. 152-158).—In the present study (E. S. R., 90, p. 351), chlamydospores from this grass were afterripened in host tissue free of contaminating organisms. Spores prepared free of host tissue were

<sup>3</sup> *Austral. Jour. Expt. Biol. and Med. Sci.*, 14 (1936), No. 3, pp. 199-213, illus. 5.

also successfully afterripened on filter paper strips incubated at 35° C. in a moist chamber. Agitating the chlamydospores in a Waring blender hastened afterripening and enhanced germinability. Fresh chlamydospores stored at 5° for 60 days and then transferred to an incubator at 35° required longer to afterripen than when stored at 25°. Water in contact with spores was necessary for successful afterripening. Those incubated in a saturated atmosphere required a longer incubation period; incubated dry, they failed to become germinable.

A study of domestic ergot of wheat and rye, A. E. SCHWARTING and L. D. HINER. (Ohio State Univ.). (*Jour. Amer. Pharm. Assoc., Sci. Ed.*, 34 (1945), No. 1, pp. 11-16, illus. 6).—Experimentation was carried out to analyze various domestic ergots (*Claviceps purpurea*) of wheat and rye, including comparative pharmacognostic and pharmacologic studies. Small-scale field culture methods were tried for two seasons to ascertain the probable commercial possibilities of artificially inoculating rye heads to increase the ergot yield. Data collected during 1940-43 established the following conclusions: Structural variations between domestic rye and wheat ergot are limited to compactness of the pseudoparenchyma, the rye form being more deeply fissured. Chemical assays showed that domestic ergots of rye and wheat compare favorably with Spanish and Russian samples and that the material from rye is slightly higher in alkaloidal yield than that from wheat. Biological assays indicated that the domestic ergots meet official standards, the product from rye, however, exhibiting a higher potency than that from wheat. Field culture methods gave increases in infection and yield of ergot of rye; the practical utilization of such methods can be determined only by large-scale operations over a period of years and with suggested controls.

Survival of buffalo grass following submersion in playas, H. G. PORTERFIELD. (U. S. D. A. coop. Tex. Expt. Sta.). (*Ecology*, 26 (1945), No. 1, pp. 98-100, illus. 2).

Synthetic culture media for the root-rot fungus, *Phymatotrichum omnivorum*, W. N. EZEKIEL. (Tex. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 3, pp. 159-161).—The author briefly reviews his own studies and those of others (13 references) on synthetic media for the Texas root rot fungus, with special emphasis on the finding that among the heavy metals used, lack of Zn reduced growth most sharply, lack of Fe somewhat less, and lack of Mn or Cu to a still lesser extent. In recent work, the various synthetic media have generally been used with additions of the metals. For convenient reference, the more important formulas as now used are assembled here.

The prevention of seed-borne diseases of flax by seed disinfection.—II, Comparison of the dusting, short wet, and fixation methods of treatment, A. E. MUSKETT and J. COULOUN. (*Ann. Appl. Biol.*, 31 (1944), No. 4, pp. 295-300).—In continuation (E. S. R., 89, p. 688), suitable organic mercury preparations applied by the short wet method, as well as dusts of the type used for treating cereal seed—fixed to the seed with water by the fixation method—gave as satisfactory control of seedling blight (*Colletotrichum lini*) and better control of stem break and browning (*Polyspora lini*) than a proprietary dry fungicide containing tetramethylthiuram disulfide applied at the rate of 12 oz. per hundredweight of seed. Treatment of seed severely infected with *P. lini* by an efficient fungicide resulted in highly significant increases in both crop and fiber yields; similar treatment of seed heavily infected with *C. lini* significantly increased the yields of fiber but not of the crop. Some treatments significantly increased the crop and fiber yields even when the seed used was only slightly contaminated with these fungus pathogens. The findings strongly support the suggestion that effective seed treatment may produce an increase in fiber not directly attributable to the prevention of these infec-

tions but explainable by a general beneficial effect from the seed disinfection. No treatment appeared consistently to affect crop establishment in the field.

**New and unusual potato diseases**, R. W. Goss (*Amer. Potato Jour.*, 22 (1945), No. 2, p. 55).—A note on purple-top wilt caused by the aster yellows virus, with brief mention of some of the tuber rots that were either new or easily confused.

Observations on a severe strain of potato virus X, P. E. M. CLINCH (*Roy. Dublin Soc., Sci. Proc.*, n. ser., 23 (1944), No. 27-30, pp. 273-299, illus. 9).—A spontaneously occurring disease in seed potato stocks characterized by symptoms of severe mosaic and necrosis was found due to a strain of virus X; the symptoms induced by it in 32 potato varieties are described. The disease in this crop was characterized by a striking decrease in virulence, this usually taking place in the third year of infection of the clone and occurring consistently in all varieties. The recovered plants contained a mild strain of virus; reasons are advanced for the theory that recovery was due to mutation of the severe strain to a mild form. In other solanaceous hosts the symptoms consisted of local and systemic necrosis, severe mosaic, and stunting; of a large number of nonsolanaceous plants inoculated with the severe strain, only *Lamium hybridum* became systemically infected, *Veronica agrestis*, beetroot, and mangold reacting with only local lesions. The physical properties and serological reactions of the severe form were similar to those of other X strains; plants infected with a mild strain proved immune to infection with the severe strain by sap inoculation but not by grafting. U. S. D. A. Seedling 41956 was immune to the severe strain. In double-grafted plants over 2.5 mo. old, severe X passed freely downwards through intermediate scions of 41956; upward movement in plants of the same age was inhibited by the presence of the immune variety. The significance of these findings is discussed. Considerable spread in the field resulted from contact between diseased and healthy plants of a tolerant variety; that no insect vector was involved was indicated by the absence of infection in plants grown in proximity to but not actually touching diseased sources. Symptoms in the field were rarely observed in the current year of infection; the production on the same tuber of healthy and diseased shoots following field infection is discussed. Plants of intolerant varieties failed to become infected in the field by contact with disease sources. The relation of the severe strain to Salaman's X<sup>N</sup> virus is examined, and the problem of identifying X strains is discussed.

**Partial composition of tobacco mosaic virus protein**: The amide, tyrosine, tryptophane, cystine (plus cysteine), and methionine contents, R. J. BEST and J. W. H. LUGG (*Austral. Jour. Expt. Biol. and Med. Sci.*, 22 (1944), No. 4, pp. 247-250).—Of the protein nitrogen (the purified protein contained 16.6 percent N), the percentage estimations were for amide 8.05, tyrosine 1.72, tryptophan 1.74, cyst(e)ine 0.53, and methionine 0. Expressed as percentages by weight of the protein, the corresponding values were for ammonia (amide) 1.62, tyrosine 3.68, tryptophan 2.1, cyst(e)ine 0.75, and methionine 0. No sulfate S could be detected.

**The serology of the tobacco mosaic virus**.—II, The action of various salts and salt concentrations in the agglutination reaction, N. ATKINSON (*Austral. Jour. Expt. Biol. and Med. Sci.*, 22 (1944), No. 4, pp. 231-236).—In further studies,<sup>4</sup> the serological optima and the end titer of the antiserum did not remain constant. The system appeared less susceptible to variations in technic in potassium phthalate or potassium malate solution than in NaCl solution. It is suggested that the variation in the serological results arose, in part at least, from the nature of the antigen.

**Viruses described primarily on leguminous vegetable and forage crops**, F. WEISS (*U. S. Dept. Agr., Plant Disease Rptr.*, 1945, Sup. 154, pp. 31-80).—This is

<sup>4</sup> *Austral. Jour. Expt. Biol. and Med. Sci.*, 17 (1939), No. 4, pp. 333-343, illus. 3.

the second in this series of descriptive lists of plant viruses (E. S. R., 91, p. 692). In addition to descriptions of the typical viruses associated with legumes, an annotated list of other viruses and of virus diseases and similar maladies occurring on this plant group is included. It has been the aim to present an organized summary of the available literature and the list is believed to be reasonably complete as of the time of writing, but notices regarding omissions will be welcomed.

**Recognition and control of vegetable diseases,** K. S. CHESTER and J. H. McLAUGHLIN (*Oklahoma Sta. Cir.* 117 (1945), pp. 16, illus. 1).—General sections of this informative circular consider how diseases may be recognized and how losses therefrom may be reduced. The second half of the pamphlet presents in tabular form pertinent information on the specific diseases, their symptoms, and recommended methods of control.

**Copper injury to beans** (*New Jersey Sta. Plant Disease Notes*, 22 (1945), No. 1, pp. 2-4).—Tests of the preceding 6 yr. indicate beans to be very subject to injury by sprays and dusts containing Cu; such damage may easily equal or exceed the benefits from the insect or disease control effected. In New Jersey, where bean diseases controllable by these treatments are of minor importance, it would seem advisable to limit applications to insecticides, except where downy mildew threatens the late crop. In preliminary trials, Fermate gave no evidence of plant injury.

**The name of *Ansatospora macrospora*,** H. N. HANSEN and C. M. TOMPKINS. (Univ. Calif.). (*Phytopathology*, 35 (1945), No. 3, pp. 218-220, illus. 1)—On a priority basis the name of the fungus causing storage rot of celery and certain other diseases is changed from *A. macrospora* (Ostw.) Newhall to *A. acerina* (Hart.) n. comb.

**A pythium rot of cucumbers,** F. T. BROOKS (*Brit. Mycol. Soc. Trans.*, 27 (1945), pt. 3-4, pp. 134-136).—A rot of cucumber fruits caused by a *Pythium*—probably *P. ultimum*—is described; the symptoms are like those described by Drechsler (E. S. R., 53, p. 851) for "cottony leak" due to *P. aphanidermatum*. The present fungus has produced no sex organs but is otherwise identical in morphology and pathogenicity with *P. ultimum*.

**Bacterial wilt of the egg-plant,** V. A. WAGER (*Farming in So. Africa*, 19 (1944), No. 223, pp. 661-664, illus. 3).—In many parts of South Africa the limiting factor in eggplant production is said to be the wilt disease caused by *Bacterium solanacearum*. In the laboratory variety tests reported, Matale and Kopek exhibited a high degree of resistance, but when planted in the field the former showed considerable susceptibility. General information concerning the disease is briefly presented.

**Effect of seed treatment on protection, rate of emergence, and growth of garden peas,** L. D. LEACH and P. G. SMITH. (Calif. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 3, pp. 191-206, illus. 3).—In pasteurized soil none of the seed treatments tried on disease-free pea seeds gave more rapid germination or larger seedlings than the nontreated control. At low temperatures yellow cuprous oxide delayed emergence and absorption from the cotyledons besides producing necrotic areas thereon. As a measure of emergence rates, the calculation of a mean emergence period is suggested; comparisons of emergence rates should be limited to trials in sterilized soil or between seed treatments having equal protective effects. A comparison of protective values in soil heavily infested with *Pythium ultimum* showed Semesan, yellow copper oxide, and dichloro-naphtho-quinone to be the most effective among the materials tested. In field trials, however—with moderate or light infestations—Spergon proved as effective a treatment as any; yellow copper oxide was injurious in some trials. It is concluded that under the experimental conditions used, the benefits of seed treatment were due entirely to disease pre-

**Tomato diseases in Michigan.** M. C. STRONG (*Michigan Sta. Cir.* 139, rev (1945), pp. 47, illus. 24)—The purpose of this revision (E. S. R., 67, p. 143) was to describe the common tomato diseases and to discuss their control so that growers may be able to identify and combat or prevent them. In its preparation, "all available pertinent information and publications of this and other experiment stations have been consulted."

**Pullularia pullulans storage fruit spot of tomato.** C. F. TAYLOR and L. SHANOR. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 3, pp. 210-212, illus. 1)—An apparently undescribed fruit spot on stored tomatoes in West Virginia was found due to *P. pullulans*. Its mycelium at first forms a light-colored mat under the epidermis, and the immediately surrounding area appears water-soaked. Soon a depression appears, and the mycelium in the center eventually becomes deeply pigmented, this black area being surrounded by a lighter region. The mass of mycelium tends to remain on the skin when the fruit is peeled. Pure culture inoculations of ripe or nearly ripe fruit resulted in lesions in about 10 days at 7.5°-10° C.; development was slower on the green fruit. The disease was originally detected on fruit which had been stored at temperatures lower than normal for tomatoes; the parasitic tendencies of the fungus at higher temperatures have not been investigated.

**The effect of manure and of commercial fertilizer on susceptibility of young apple trees to black root rot.** J. S. COOLEY. (U. S. D. A.) (*Phytopathology*, 35 (1945), No. 3, pp. 207-209)—Annual manuring and inoculation tests with *Xylaria mali* on young apple trees for 7 consecutive years indicated that the percentage and size of lesions are not materially affected by manuring. For 4 consecutive years young apple trees were given applications of the seven fertilizer combinations N-K-P, N-P, N-K, N, K, and P and were inoculated with *X. mali*; at the end of each year as well as at the end of the experiment no appreciable differences could be observed in the number of lesions or their size on fertilized or nonfertilized plots.

**A progress report on spraying experiments for the control of powdery mildew of apple.** E. L. REEVES, F. L. OVERTON, W. J. O'NEILL, J. H. SCHULTZ, and E. J. ANDERSON. (*Wash. State Col. coop U. S. D. A.*). (*Wash. State Hort. Assoc. Proc.*, 40 (1944), pp. 168-175).—Sprays involving use of oils were employed in the first-brood codling moth treatments applied to all trees used in the powdery mildew tests. Observations on foliage injury during the growing season indicated its occurrence only on the mildew plots receiving sulfur spray—either as lime-sulfur or Kolofoog. Foliage injury was most severe on the mildew plots receiving both a "pink" and a calyx spray of lime-sulfur; no serious injury occurred on the plot receiving "prepink" and pink sprays of Kolofoog, but noticeable injury was noted on a plot receiving pink and calyx sprays. Injured foliage apparent in early June had dropped by late summer. On trees where mildew development was not checked, many of the buds on fruit spurs were seriously injured, thereby affecting the next fruit crop. Of the sprays used during 1944, none was as effective in controlling mildew as the standard lime-sulfur. Preliminary results with Elgetol appear, however, to justify its use in more extensive trials as a mildew spray. Because of the extensive development of the disease early in the 1944 season, application of the prepink mildew sprays gave excellent results and those applied after the pink stage had relatively less value.

**Promising new fungicides on apples and cherries.** A. B. GROVES. (Va. Expt. Sta.). (*Va. Fruit*, 33 (1945), No. 1, pp. 139-142).

**Control of cranberry fruit rots by spraying.** R. B. WILCOX and H. F. BERGMAN. (Coop. N. J. and Mass. Expt. Stas.). (*U. S. Dept. Agr. Cir.* 723 (1945), pp. 6, illus. 1).—Since bordeaux has in many cases failed to give satisfactory control of

cranberry fruit rots—particularly in New Jersey—efforts to find a better means of control were carried out in that State and in Massachusetts during 1943-44. The preliminary results here summarized appear to indicate that Fermate is much more effective on seriously infected bogs. The proportions of  $\text{Cu}_2\text{SO}_4$  to lime in the bordeaux did not appear to influence the degree of control, but an 8-4-100 mixture left less residue on the fruit and required a smaller bulk of ingredients than the 8-8-100 formula for the same amount of spray. The importance of the early applications of either spray is emphasized. Detailed spray recommendations are given.

Pierce's disease of grapevines: Vectors, hosts, and control, J. H. FREITAG, N. W. FRAZIER, and W. B. HEWITT. (Univ. Calif.). (*Wine Rev.*, 13 (1945), No. 2, pp. 18, 20, 22, 28, illus. 1).—Brief statements are made on the history, distribution, and virus nature of the disease and the losses involved, and a summary is presented of the results of experimental work involving the relations of roguing, culture methods, and vector populations to the incidence of the disease, grape-shoot management in relation to its control, the insect vectors (including transmission studies, life histories, and host plants), and vine resistance to the disease.

Powdery mildew or oidium-disease of the vine, S. J. DU PLESSIS (*Farming in So. Africa*, 19 (1944), No. 223, pp. 641-648, 668, illus. 10).—In control tests with bordeaux, a manganese sulfate-lime mixture, and sulfur, the last proved outstandingly best. Lime alone was totally ineffective, and addition of lime to sulfur reduced its efficiency. Dilutions of the sulfur, even with 20 percent kaolin, had no weakening effect on its efficacy. Sulfur was also found one of the best fungicides for controlling anthracnose and the leaf spots due to *Isariopsis* and *Exosporium*. The symptoms and occurrence of powdery mildew of grapes as it occurs in the Western Province, Union of South Africa, are discussed.

[Avocado decline] (*Calif. Avocado Soc. Yearbook*, 1944, pp. 24-35).—The following papers are included: Avocado Decline Investigations—a Progress Report, October 27, 1944, by R. W. Hodgson (pp. 24-27) (Univ. Calif.); Rain and Drought in Avocado Decline, by M. Donnelly (pp. 27-31) (U. S. D. A. and Univ. Calif.); Avocado Tree Decline! So What? by J. G. France (pp. 31-35); and Avocado Decline in Central America, by W. Popenoe (p. 35).

Toxicity of boron for avocado seedlings, A. R. C. HAAS. (Calif. Citrus Expt. Sta.). (*Calif. Avocado Soc. Yearbook*, 1944, pp. 66-68, illus. 2).—Boron deficiency in avocado has been previously dealt with (E. S. R., 91, p. 306). Soil analyses have indicated that the soils in avocado orchards are usually supplied with adequate available B. Since, however, B is being applied to some orchards against the decline trouble, experiments were conducted which led to the conclusion that when excessive B is brought into full contact with avocado roots, severe injury occurs.

Nutrient deficiencies of citrus—symptoms, cause, and control, H. D. CHAPMAN, S. M. BROWN, and D. S. RAYNER. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 25 (1945), No. 3, pp. 17-28, illus. 10).—This is a comprehensive summary (15 references) of present knowledge on Fe, Mn, Zn, Cu, N, P, and S deficiency diseases of citrus. Six of the illustrations are in color.

Quick decline of citrus associated with sour rootstock (*Calif. Citrog.*, 29 (1944), No. 9, p. 245).

Rootstock in relation to quick decline of citrus, F. F. HALMA, K. M. SMOVER, and H. W. SCHWALM. (Univ. Calif. et al.). (*Calif. Citrog.* 30 (1945), No. 5, pp. 150-151, illus. 1).—Further efforts to find affected trees on sweet orange stock appear to warrant the assumption that trees on sour stock are susceptible and those on sweet stock are resistant. This is based on data from 46 orchards, in 13 of which the survey was thorough and in the rest of an exploratory nature. In

this survey, three methods of identifying the rootstock were employed, viz. by rootstock sprouts, by type of bud union, and by the chemical method (E. S. R., 61, p. 837).

Rootstock in relation to quick decline of citrus, F. F. HALMA, K. M. SMOVER, and H. W. SCHWALM (*Citrus Leaves*, 25 (1945), No. 3, pp. 11, 42).—See preceding abstract.

The "phloem necrosis" virus disease of tea in Ceylon.—II, Field observations and effect on yield, T. E. T. BOND (*Ann. Appl. Biol.*, 31 (1944), No. 4, pp. 300-310, illus. 4).—After a brief discussion of the methods and accuracy of field diagnosis, the results of further work (E. S. R., 91, p. 560) involving plot records over a period of years are presented and compared with figures from estates on the routine removal of nonproductive diseased bushes. On the basis of all the evidence, a frequency of at least 25 percent diseased bushes is suggested for the aggregate acreage of tea above 6,000 ft.; no reliable estimate is possible for lower elevations. Despite the pronounced effect on individual bushes there appears to be no general tendency for the yields from affected estates to decline. The great variability in individual bush yields is stressed, and it is concluded that elimination of unproductive bushes and their replacement by types so far remaining unaffected—though carrying the virus—will more than counteract the effect of the continual and gradual deterioration of the necrotic bushes remaining. The field distribution of diseased bushes is irregular and the rate of spread in different areas highly variable. The results of two roguing tests lend further emphasis to the importance of bush-to-bush spread. The course of the disease in these experiments has been expressed by the Verhulst-Pearl logistic curve, from which it appears that complete roguing of all "necrotic" and "suspected" bushes at 6-mo. intervals has reduced the rate of spread to about a third of the value for nonrogued plots.

Control of the shot-hole disease of almonds in 1945, E. E. WILSON. (Calif. Expt. Sta.). (*Almond Facts*, 8 (1944), No. 6, p. 9, illus. 1).—The nature and cause (*Coryneum beijerinckii*) of the disease are explained, and the control method that has proved most successful is outlined. By delaying application of a fungicidal spray until the blossoms emerge but before the petals are open ("popcorn stage"), a greater measure of protection is given to the blossoms and a fairly effective prevention of leaf infection is obtained. Since the popcorn spray covers few if any leaves, a second treatment is also necessary. Copper-containing sprays appeared somewhat more satisfactory than those containing sulfur.

To prevent scale-rot in propagating Easter lilies—use of certain fungicides multiplies number of bulbs, W. D. McCLELLAN and N. W. STUART (*South. Florist and Nurseryman*, 57 (1945), No. 51, pp. 5-6, illus. 3).—A brief summary of further progress in studies previously noted (E. S. R., 92, p. 383), presented for the benefit of growers.

Relation of macrofungi and micro-organisms of soils to damping-off of broadleaf seedlings, E. WRIGHT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 4, pp. 133-141, illus. 2).—The occurrence of sporophores of *Cyathus vernicosus* was found associated with soils favoring seedlings of broadleaf trees, while an abundance of sporophores of *Naucloria semiorbicularis* or *Coprinus* spp. was observed in soils where damping-off losses had been generally high. Soil micro-organisms were studied by dilution-plate counts and by a modified Cholodny microslide technic. Results with the first method were inconsistent, but the general trend indicated that the greater the number of fungi in the soil the heavier the damping-off, whereas such losses were in inverse ratio with the number of bacteria. By the modified Cholodny technic, dried agar-coated slides were inserted in the soil to furnish a medium for fungi, bacteria, and other micro-organisms. Nematodes were frequently abundant, appearing most numerous in soils previously in

cereals and on which damping-off had been relatively light. This method is believed of value for detailed study of the microbial population of the soil. On the basis of the findings, it is believed unlikely that detailed microbiological studies of the soil will prove of practical value in predicting damping-off losses.

**Blight of oriental arborvitae**, A. G. PLAKIDAS. (La. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 3, pp. 181-190, illus. 3).—A destructive disease of *Thuja orientalis* known locally as "blight" or "fire" is characterized by necrosis and shedding of foliage and branchlets and the formation of bark cankers on small twigs. Its cause was demonstrated to be a *Cercospora*, here described as *C. thujina* n. sp. Perithecia of *Mycosphaerella* sp. were often found on the diseased leaves and branchlets, and it was at first believed that this might be the ascigerous stage of the *Cercospora*. Repeated inoculations with several ascospore isolates of the *Mycosphaerella* failed, however, to cause infection; it must therefore be assumed that this fungus bears no relation either to the *Cercospora* or to the disease. A limited spraying test using 4-4-50 bordeaux, cuprous oxide (Cuproicide, 89 percent Cu) at the rate of 3 lb. to 100 gal. water and basic copper sulfate (Tennessee Copper Co. "Tri-basic," 53 percent Cu) at the rate of 6 lb. to 100 gal. water completely checked the progress of the disease on infected plants.

**Root disease of Castanea species and some coniferous and broadleaf nursery stocks caused by Phytophthora cinnamomi**, B. S. CRANDALL, G. F. GRAVATT, and M. M. RYAN. (U. S. D. A. coop. Univ. Ga.). (*Phytopathology*, 35 (1945), No. 3, pp. 162-180, illus. 3).—*P. cinnamomi* is reported as the cause of a root rot similar to the "ink disease" of European chestnuts on the American chestnut in Maryland, Virginia, North and South Carolina, Georgia, Alabama, Tennessee, and Mississippi; it was also found causing the same disease on *C. ozarkensis* in Arkansas. Other native chinkapins have been killed by this fungus where they occurred within the range of the chestnut. It is believed that this disease is responsible for the recession of the American chestnut from the lower Piedmont area of the Atlantic States into the higher elevations of the mountains and from southern Mississippi and Alabama into the hilly regions in the northern parts of those States; it is known also to have caused the recession of the Ozark chinkapin. The pathogenicity of *P. cinnamomi* was demonstrated on its native chestnut and chinkapin hosts. In addition, this fungus causes a similar root disease on 20 coniferous and broadleaf hosts growing in nurseries in Arkansas, Delaware, Georgia, Louisiana, North Carolina, Maryland, and Virginia. Field and greenhouse inoculations have indicated the European chestnut (*C. sativa*) to be susceptible; the Asiatic species, *C. crenata*, *C. mollissima*, *C. henryi*, and *C. seguini*, are highly resistant. In greenhouse inoculations, Douglas fir (*Pseudotsuga taxifolia*) also proved highly susceptible. There are 38 references.

The culture designated Madison 517 identified as *Polyporus tulipiferus*, E. F. DARLEY and C. M. CHRISTENSEN. (Minn. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 3, pp. 220-222, illus. 1).—When sporophores of the culture Madison 517 and *P. tulipiferus* were produced on artificially inoculated wood, the fruit bodies of both isolates proved typical of those formed in nature by the latter fungus. Measurements of spores, basidia, and cystidia from the fruit bodies of each isolate also agreed with each other and with the description given for *P. tulipiferus*, thus proving that the culture originally designated as *Fomes annosus* and later known as Madison 517 is *P. tulipiferus*.

**Poria microspora** in house timbers, R. R. HIRT and J. L. LOWE (*Phytopathology*, 35 (1945), No. 3, pp. 217-218, illus. 1).—*P. microspora* was found causing serious decay in a new modernly constructed house at Syracuse, N. Y. The fungus is believed to have been introduced in poorly seasoned lumber and to have flourished

because the restricted ventilation in insulated walls of modern structures creates conditions favorable to the growth of wood-rotting fungi introduced on such lumber.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

Transactions of the Ninth North American Wildlife Conference (*Washington 5, D. C.: Amer. Wildlife Inst., 1944, pp. 376+, illus. 17*)—The following papers are of special interest to wildlife management: Some Federal Functions in Wildlife and Forest Management, by L. F. Watts (pp. 6-12) (U. S. D. A.); Functions of Industry in Wildlife and Forest Management, by G. H. Collingwood (pp. 13-18); Soil Fertility and Wildlife—Cause and Effect, by W. A. Albrecht (pp. 19-28) (Univ. Mo.); Remarks on Wildlife Conservation in Canada, by H. F. Lewis (pp. 39-42); Conservation—a Sound Basis for Future Greatness, by C. R. Wickard (pp. 42-48) (U. S. D. A.); Report of the Pan-American Section of the International Committee for Bird Preservation, by H. Lloyd (pp. 61-62); Wildlife, the Public Interest and the Law—an Approach to the Problem of Public Land Management, by P. R. Harris (pp. 96-105); Reclamation Protects Wildlife Interests, by W. E. Warne (pp. 124-130); Restoration of Wild Bison, by V. H. Cahalane (pp. 135-143); A Study of the Carrying Capacity of Deer Yards as Determined by Browse Plots, by L. A. Davenport, W. Shapton, and W. C. Gower (pp. 144-148); Roadside Deer Counts As an Emergency Census Method, by T. A. Schrader (pp. 150-154); Studies of the Productivity of Mule Deer in Central Utah, by W. L. Robinette and O. A. Olsen (pp. 156-161) (U. S. D. A.); Arkansas' Deer Transplanting Program, by R. Wood (pp. 162-167); The Murderers Creek Deer Herd, by G. E. Mitchell (pp. 167-172) (U. S. D. A.); Our Big Game in Winter, by O. J. Murie (pp. 173-176); Factors Affecting the Growth of Fish, by J. V. Oosten (pp. 177-183); The Effect of Species Combinations on Fish Production, by G. W. Bennett (pp. 184-188) (Ill. Nat. Hist. Survey); Increasing the Production of Food for Fish, by S. Wright (pp. 190-194); The Role of Legal Restrictions in Fish Management, by T. H. Langlois (pp. 197-200); Harvesting the Fish Crop, by R. W. Eschmeyer (pp. 202-208); Problems of Competition and Predation [in Fish Management], by K. F. Lagler (pp. 212-219); Cooperation Between Game and Commercial Fishery Interests, by C. E. Jackson (pp. 224-228); Managing the Waterfowl, by I. N. Gabrielson (pp. 264-269); Law Enforcement in the Waterfowl Program, by W. E. Crouch (pp. 270-272); Waterfowl Refuge Administration in Wartime, by A. C. Elmer (pp. 272-275); Canadian Waterfowl Management Problems, by J. D. Soper (pp. 277-281); Control of Waterfowl Depredations, by A. M. Day (pp. 281-287); The Role of Impoundments in Postwar Planning for Waterfowl, by C. Cottam (pp. 288-295); Control of Undesirable Plants in Waterfowl Habitats, by F. M. Uhler (pp. 295-303); A Cooperative Approach to Farm Game Management, by C. W. Watson (pp. 304-308); The Development of Waste Areas on the Farm for Upland Game Cover, by J. W. Kimball (pp. 309-314); Wildlife Relationships to Soil Types, by A. H. Denney (pp. 316-322); The "Crash" Decline in Sharp-Tailed Grouse and Hungarian Partridge in Western Canada and the Role of the Predator, by B. W. Cartwright (pp. 324-329); The Significance of Population Turnover in Upland Game Management, by M. O. Steen (pp. 331-335); Populations, Hunting Pressure, and Movement of Ohio Raccoons, by R. T. Butterfield (pp. 337-343); Some Accomplishments of Conservation Education in an Intensively Agricultural State, by G. O. Hendrickson (pp. 345-350) (Iowa Expt. Sta.); "Little Climates"—a Lesson in Conservation Extension Education, by E. L. Palmer (pp. 354-357) (Cornell Univ.); and Conservation Is not Inherited, by W. P. Taylor (pp. 358-362) (Tex. A. and M. Col.).

Wildlife values of the lespedezas, V. E. DAVISON. (U. S. D. A.). (*Jour. Wildlife Mangt.*, 9 (1945), No. 1, pp. 1-9, illus. 2).—Three types of lespedezas are said to be of value in wildlife conservation, but only 5 or 6 of the 150 species have proved adaptable to American use. *Lespedeza striata* and *L. stipulacea*—both annuals—are useful for bobwhites and may be grown extensively on croplands and pastures. Of several herbaceous perennials, only sericea (*L. cuneata*) has proved of value; though a poor food, it provides ground cover for bobwhites and rabbits and is particularly adaptable to the herbaceous parts of wildlife borders between croplands and woodlands. Of the shrubby species, *L. bicolor* and a few others provide excellent food and fair shelter for bobwhites, rabbits, and possibly deer. These species are suited to woodland borders, hedges, and food patches or strips where a fall ripening legume is needed. Establishment of direct seeding is successful. Improved strains are being developed. All three types of lespedezas appear to be needed to make the best havens for game on farm lands and preserves. The annuals should be grown as a part of crop rotations; both the sericea and shrub types should be established on lands primarily of use for wildlife.

First fruiting of woody food plants in Connecticut, G. P. SPINNER and G. F. OSTROM. (Univ. Conn.). (*Jour. Wildlife Mangt.*, 9 (1945), No. 1, p. 79).—The age of fruiting of woody food plants is important in determining when plantings will become available for wildlife use. As a result of a study during the fall of 1942, information is presented for some 27 plant species as grown in the wild and in nurseries.

A checklist of Kansas mammals, 1943, C. W. HIBBARD (*Kans. Acad. Sci. Trans.*, 47 (1944), No. 1, pp. 61-88).—An annotated list.

Weather and the kill of white-tailed deer in Maine, C. B. FOSES (*Jour. Wildlife Mangt.*, 9 (1945), No. 1, pp. 76-78, illus. 1).—This study substantiates the previous belief of many sportsmen that the number of white-tailed deer killed during an open hunting season is closely related to the prevailing weather. The minimum kill occurred during hunting seasons (1939-42) without snow and with temperatures and precipitation below normal. Ideal hunting is afforded by a damp forest floor, allowing the hunter to stalk his game quietly. Precipitation either by rain or snow—the direct source of all ground moisture—appeared largely responsible for determining the number of deer killed in any one season.

Trapping North American furbearers: A complete guide on trapping all North American furbearers for both amateur and professional, also deer hunting, turkey hunting, bear hunting, tracks and tracking, lures and baits, skinning and handling fur, etc., S. S. HAWBAKER ([n. p.]: Author [1944], 4. ed., rev., pp. 216, illus. 83).

Tularemia: Spontaneous occurrence in the chipmunk, R. R. PARKER (*Pub. Health Rpts.* [U. S.], 60 (1945), No. 1, p. 17).—The recovery of *Pasteurella tularensis* from *Eutamias* sp. adds this rodent to the already long list of native animals in which tularemia occurs spontaneously.

Muskrat investigations in Texas, D. W. LAY (*Jour. Wildlife Mangt.*, 9 (1945), No. 1, pp. 56-76, illus. 5).—The Louisiana muskrat *Ondatra sibethica rivularis* is said to be the major crop on about 260,000 acres of marsh on the southeastern coast of Texas. The author here summarizes management developments on the 4,300-acre Jackson marsh and life history observations since 1938. Among the matters considered are grades of pelts and the proportion damaged, age groups and methods of determining them, sex ratios and weights, reproduction, and predation by marsh hawks, raccoons, minks, and water moccasons. There was marked dispersal of muskrats in late winter and spring—of value in restocking vacant habitats. Management of marshes includes control of water levels and soil-water salinity, construction of levees, proper burning, elimination of cattle grazing, and some

predator control. Management of trapping includes proper location of trappers and allotment of trapping territories, movement of traps, daily running of traps, ending trapping at the correct time, and proper care of the trappers.

Rat control at Fort Devens, G. J. COOGAN ([U. S.] *Off. Surg. Gen., U. S. Army Med. Dept. Bul.* 85 (1945), pp. 64–71, illus. 3).—This is an account of the eradication of rats in the post dump, involving test-baiting to determine the kind of food acceptable to the rats, prebaiting to train them to come to a definite fixed place to obtain food, and, finally, providing poisoned bait. The chance poisoning of pets or inadvertent transportation of bait was minimized by using bait boxes with openings too small to admit cats or dogs.

Food habits of the raccoon in eastern Texas, R. H. BAKER, C. C. NEWMAN, and F. WILKE (*Jour. Wildlife Manag.*, 9 (1945), No. 1, pp. 45–48).—Acorns and crayfish were found to constitute over half the yearly diet, and both were consumed in considerable quantities at all seasons. Persimmons and grapes were utilized heavily when available and other fruits in smaller amounts. Insects and other invertebrates also formed an important part of the diet. Vertebrates were eaten sparingly, but species of water snakes were preyed upon, as were also winter and spring concentrations of waterfowl. Raccoons concentrated in timbered river bottoms during winter and spring, feeding largely on acorns and crayfish. Under these conditions they are readily trapped. In summer and fall the populations are apparently dispersed through both uplands and bottomlands in search of seasonal foods.

Pre- and post-hunting season foods of raccoons on an Illinois goose refuge, L. E. YEAGER and W. H. ELDER (*Jour. Wildlife Manag.*, 9 (1945), No. 1, pp. 48–56).—About 40,000–50,000 Canada geese winter on the refuge under study; the annual kill averages 7,000–18,000, and crippling losses amount to 1,000–2,000 birds each season—almost all of which become food for raccoons and other carnivores. To compare the effect of this heavy crippling loss on the diet of raccoons, 116 pre-hunting season and 107 posthunting season scats were analyzed. The prehunting (early fall) food in bulk was 33.8 percent of animal origin, 30 percent being insects. In the posthunting (winter) sample, 72.1 percent was animal, 65.1 percent being Canada geese. In both cases most of the remaining food was vegetable, detritus—chiefly soil and gravel—constituting only 2.1 and 4.3 percent, respectively. For all foods, availability determined the time of maximum utilization. The dominating position of geese over all other foods for raccoons during winter was the expected result of great abundance, maximum availability, and high palatability. Other carnivores utilizing the geese included red and gray foxes, opossums, minks, skunks, and feral dogs. Limited utilization of geese by fur animals prevented complete loss, but this return on the number of birds involved, even as a byproduct of hunting, is considered inadequate.

Addenda to the list of birds of Alachua County, Florida, II, J. C. DICKINSON, JR. (Univ. Fla.). (*Fla. Acad. Sci. Proc.*, 7 (1944), No. 2–3, pp. 191–192).—A supplementary annotated list.<sup>5</sup>

A raptor census in Montana, R. W. HIATT. (Mont. State Col.). (*Amer. Midland Nat.*, 31 (1944), No. 3, pp. 684–688, illus. 1).—The author's object was to interpret the apparently dense raptor population of the State via extensive roadside tallies. Therefore, in addition to analyzing what may well be the greatest concentration of birds of prey over a vast area of the United States—if not of the entire continent—the present information adds materially to our knowledge of the ranking of several raptorial species in Montana and, to a lesser extent, serves to portray a quantitative index to these forms. The majority of raptors were found to occur on a State-wide basis. A total of 551 raptors was observed for

<sup>5</sup> *Fla. Acad. Sci. Proc.*, 1 (1936), pp. 91–102; 4 (1939), pp. 106–107.

each 4.5 miles traveled. A frequency-of-occurrence analysis of individual species indicated that sparrow hawks and marsh hawks are by far the most abundant—coinciding with data published on similar censuses in the western United States. Sparrow hawks predominated in western and southern Montana; marsh hawks in the north and east. Three concentrations are described where raptors occurred as frequently as 2 per mile traveled. The distinct reflection on raptor species occasioned by types of prey present is indicated.

An improved game bird trap, H. L. KURTZ (*Jour. Wildlife Manag.*, 9 (1945), No. 1, pp. 35-38, illus. 1).—A trap for taking both pheasants and ducks alive is described and illustrated.

Do birds cross the Gulf of Mexico in spring? G. G. WILLIAMS (*Auk*, 62 (1945), No. 1, pp. 98-111, illus. 1).—The author found no direct evidence to show that birds migrating from regions south of the United States in spring actually cross the Gulf of Mexico in any appreciable numbers; there is, however, abundant evidence that vast numbers of these birds—both as to individuals and to species—take the coastwise routes around the eastern and western edges of the Gulf.

Observations on the nesting mortality of the Brewer blackbird (*Euphagus cyanocephalus*), I. LA RIVERS. (*Univ. Nev. Amer. Midland Nat.*, 32 (1944), No. 2, pp. 417-437, illus. 3).—On the basis of observations made during the spring of 1934 on the Brewer blackbird population of a 15-acre tract of chaparral and forest 14 miles northwest of Reno, Nev., it is concluded that the height of the nest above ground, the amount of natural concealment afforded by the plant chosen as the nesting site, and the protective behavior of the parent birds were definite operative forces in reducing or raising the mortality of the nesting birds and the eggs. The detailed results of the study are discussed and tabulated.

Effects of lead poisoning on reproduction of mallard drakes, E. L. CHEATUM and D. BENSON (*Jour. Wildlife Manag.*, 9 (1945), No. 1, pp. 26-29).—Because of the unsettled state of this question, the authors undertook to test the effects on game-farm mallard breeding stock, it first being necessary to determine the sub-lethal dose of lead shot sufficient to induce symptoms of poisoning and yet permit recovery and then to test the fertility of poisoned birds. The data obtained indicated that among the mallard ♂♂ used, those recovering from poisoning failed to exhibit any significant loss of fertility; similar work was lacking for the ♀♀, and the current effects of lead poisoning during the breeding season on reproductive potential were not studied. In view of the obvious reduction in vitality of poisoned waterfowl during the periods of lead absorption and of convalescence, it appears certain that breeding activity would be reduced to a minimum. On the other hand, the opportunity for wild ducks to pick up shot usually would be much less in spring than on the autumn feeding grounds.

Comparison of census methods for pheasants in Nebraska, H. E. MCCLURE (*Jour. Wildlife Manag.*, 9 (1945), No. 1, pp. 38-45).—In plans for a Nebraska upland game bird project the censusing of pheasants and tabulation of population densities were of prime importance. A summary of the data at hand and a comparison of the various methods tried are here discussed.

A study of quail food habits in peninsular Florida, A. M. LAESSLE. (*Univ. Fla. Acad. Sci. Proc.*, 7 (1944), No. 2-3, pp. 155-171, illus. 1).—Mature quail in this area were found to eat about 86 percent plant and 14 percent animal matter; the seasonal variations are presented in detail. Four plant genera (*Chamaecrista*, *Galactia*, *Quercus*, and *Arachis*) together comprised over half of the plant material eaten. Animal matter was made up largely of Orthoptera (mostly grasshoppers) and Hymenoptera (mostly sawflies), these together comprising about three-quarters of all animal matter eaten. Field studies showed that flatwoods are more frequented in spring whereas sandhills are preferred in the fall; hammocks are usually fre-

quented only in fall and winter. Use of croplands by quail is determined largely by the seasonal nature of agriculture, tending to be greatest in fall and winter; as far as food is concerned, spring is the critical period.

**Sex and age ratios among bobwhite quail in southern Missouri.** A. S. LEOPOLD (*Jour. Wildlife Manag.*, 9 (1945), No. 1, pp. 30-34).—This paper presents records on the sexes of 45,452 bobwhites and the ages of 7,700 of these, with comments on the possible significance of sex and age ratios. Young of the year constituted 72-83 percent of the fall populations of bobwhites in the State. The year-to-year fluctuations in age ratios in any one locality were attributed tentatively to the effects of spring weather on reproductive success. Populations in the agricultural regions contained higher percentages of young than those in wooded areas. Such regional differences may be due to the conditions of the nesting environment and/or the degree of hunting pressure. Distortion of the sex ratio in favor of cocks was limited to adults; the differential loss of adult hens probably occurs during the breeding season. Bobwhites in Missouri averaged about 21 gm. heavier than those in Georgia.

**The European starling in Gaspé.** S. C. BALL (*Auk*, 62 (1945), No. 1, pp. 79-97, illus. 7).—The first appearance in 1935 and subsequent history of this species on the Forillon in Gaspé, Quebec, are recorded. Data are presented on the distribution, nesting dates, behavior of adults and young and of the mixed flock, fluctuations in population and local range, migration, and the wintering of starlings in Gaspé.

**Food habits and molting of the common tree frog.** H. L. SWEETMAN. (Mass. State Col.). (*Amer. Midland Nat.*, 32 (1944), No. 2, pp. 499-501).—A brief account of observations on *Hyla versicolor* in captivity.

**The spadefoot toads in Oklahoma, with a summary of our knowledge of the group [I], II.** A. N. BRAGG (*Amer. Nat.*, 78 (1944), No. 779, pp. 517-533, illus. 5; 79 (1945), No. 780, pp. 52-72, illus. 1).

**Introduction to the study of the reptiles of Indiana.** S. MINTON, JR. (*Amer. Midland Nat.*, 32 (1944), No. 2, pp. 438-477).—A description, together with data on the size, geographic distribution, and habits, is briefly presented for each of the species of turtles, lizards, and snakes included in this paper.

**Baits for control of snails.** C. O. PERSING. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 25 (1945), No. 2, pp. 6-7, 13, illus. 2).—The principal recent developments in baits for controlling snails in citrus orchards consist in applying the bait onto the tree by hand or power blower instead of on the ground, substitution of fresh orange pulp for bran, and the use of metaldehyde baits and tartar emetic sprays. These are briefly discussed in the form of questions and answers.

**Snail baits.** C. O. PERSING. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 30 (1945), No. 4, pp. 94-95, illus. 1).—See preceding abstract.

[**Insect pests.**] (Okla. A. and M. Col.). (*Okla. Acad. Sci. Proc.*, 24 (1944), pp. 20-25, 27-34, 38-42, illus. 5).—The following brief papers are included: The Insect Pest Record for Oklahoma, 1942 and 1943, by F. A. Fenton (pp. 20-25); The Effect of Various Diluents on the Toxicity of Derris Dust to House Flies (*Musca domestica* L.) (pp. 27-28) and Insect Populations of Farm Wheat Bins in Oklahoma and Experiments in Their Control (pp. 29-34), both by F. E. Whitehead; and Green Bug Injury on Barley Varieties at Woodward, Oklahoma, in 1943, by R. R. Walton (pp. 38-42).

**Insects carried in transpacific airplanes: A review of quarantine work prior to December 7, 1941.** C. E. PEMBERTON (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], 48 (1944), No. 3, pp. 183-186).—An account is given of the efforts made to keep harmful insect species of other areas from becoming established in the Hawaiian Islands. Several records of special interest are given.

Some random observations on dragonfly habits, with notes on their predaceousness on bees, M. WRIGHT (*Jour. Tenn. Acad. Sci.*, 19 (1944), No. 4, pp. 295-301).

Observations on oviposition and adult survival of some grasshoppers of economic importance, C. J. DRAKE, G. C. DECKER, and O. E. TAUBER. (*Iowa Expt. Sta.*). (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 2, pp. 207-223, illus. 7).—Last-instar nymphs and newly emerged imagoes of the three grasshoppers most destructive to Iowa crops—the two-striped grasshopper, differential grasshopper, and lesser migratory grasshopper—were collected in four counties of western Iowa. These stock grasshoppers were confined in large screened cages on sod in the open insectary yard and provided with an abundance of corn, legumes, and wild vegetation introduced every morning and afternoon. Five pairs of newly emerged adults were placed in each of a number of the small experimental cages and 50 pairs in each of the larger experimental cages employed in this study; all cages for any one experiment were started the same day, food being supplied as in the stock cages. During the summer of 1938 the smaller cages were placed on sand benches in a roofed insectary with screened sides; the larger cages, on bluegrass sod in the open yard. The grasshoppers on the south side of the screenhouse tended to live a little longer and deposited a few more eggs than those in similar cages farther inside. In the parallel tests of 1939-40, a markedly larger number of eggs were produced under direct sunlight and other outdoor exposure than under the shaded conditions.

The first egg pods deposited by ♀♀ of all three species were larger than those deposited later. In general, ♀♀ of the lesser migratory grasshopper deposited an egg pod every 4-5 days, the two-striped species every 10 days, and the differential grasshopper every 14 days. The largest egg pod of each species contained 39, 135, and 153 eggs, respectively; similarly, the average number of eggs per pod for each was 19.6, 69.7, and 88.8 and the average numbers of eggs per ♀ 117, 129, and 128 for the three species taken in the same order. In all experiments approximately half the total egg production was completed within 8-14 days after onset of oviposition. The life span of adult ♀♀ of the two-striped species may be as much as 2.5 weeks longer than that for ♂♂ in the same type of cage; for ♀♀ in the small cages of the screened insectary the span was 21.48 days indoors and 29.04 in similar cages outdoors, and in the large outdoors cages it averaged 28.37 days. The mortality and egg-deposition curves of the different species provide data for timing and evaluating adult population surveys in the fall; the necessity of carefully differentiating species is also evident. Prediction of possible grasshopper outbreaks and estimates for poisoned bait from year to year are based largely on these adult and egg surveys.

An Ammobaenetes from Nevada (Orthoptera: Gryllacrididae), H. F. STROHECKER (*Psyche*, 51 (1944), No. 3-4, pp. 147-150, illus. 4).—A new species of grasshopper—*A. lariversi*—is described from Nevada.

Notes on some northern Canadian Siphonaptera, with the description of a new species, G. P. HOLLAND (*Canad. Ent.*, 76 (1944), No. 12, pp. 242-245, illus. 10).—The author presents Canadian records and descriptions of five species (one new) of fleas occurring north of the sixtieth parallel, resulting from a recent study of the Siphonaptera contained in the Canadian National Collection at Ottawa.

The mechanics of digestion in the calliphorid flies, C. E. ABBOTT (*Ent. News*, 56 (1945), No. 2, pp. 44-47).

Contributions to a synopsis of the Hemiptera of Missouri.—I, Scutelleridae, Podopidae, Pentatomidae, Cydnidae, Thyreocoridae. II, Coreidae, Aradidae, Neididae. III, Lygaeidae, Pyrrhocoridae, Piesmidae, Tingidae, Enicocephalidae, Phymatidae, Ploisiidae, Reduviidae, Nabidae, R. C. FROESCHNER (*Amer.*

*Midland Nat.*, 26 (1941), No. 1, pp. 122–146, illus. 38; 27 (1942), No. 3, pp. 591–609, illus. 19; 31 (1944), No. 3, pp. 638–683, illus. 33).—These are copiously annotated check lists, with accompanying keys for identification.

A new plant bug from Peru, with note on a new genus from North America (Miridae: Homoptera), T.-Y. HSIAO (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 1, pp. 24–27, illus. 4).—*Hyalochloria denticornis* n. sp. and *Saileria* n. gen. (allied to *Diaphnidea*) are described.

A new genus and twelve new species of Neotropical whiteflies (Homoptera: Aleyrodidae), L. M. RUSSELL. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 2, pp. 55–65, illus. 30).—*Crenidorsum* n. gen. and 12 new species thereof are described.

Additions to the Lachnini of Florida (Homoptera: Aphididae), A. N. TISSOT. (*Fla. Expt. Sta.*). (*Fla. Ent.*, 27 (1944), No. 3, pp. 43–54, illus. 21).—Since the previous paper (E. S. R., 82, p. 650), 78 collections of lachnids have been recorded from the State, and some additions to the list of known hosts have been added. One species each of *Essigella*, *Unilachnus*, *Longistigma*, and *Eulachnus* and eight of *Cinara* (two new) are considered here.

*Drepanaphis tissoti*, a new species of aphid from Florida, C. F. SMITH. (N. C. State Col.). (*Fla. Ent.*, 27 (1944), No. 3, pp. 55–57, illus. 6).

The relation of hind tibiae and sensoria to intermediacy in parthenogenetic aphids, C. A. LAWSON. (Mich. State Col.). (*Ann. Ent. Soc. Amer.*, 37 (1944), No. 4, pp. 409–413).—The measurements made of the hind tibial width and counts of antennal sensoria suggested that the expression of these characters in parthenogenetic ♀♀ may be considered intermediate between ♂♂ and gamic ♀♀.

The genus *Menosoma* (Homoptera: Cicadellidae) and a new genus *Spanthus* (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.). (*Bul. Brooklyn Ent. Soc.*, 39 (1944), No. 5, pp. 157–160, illus. 7).

The mealybug genus *Heterococcus* Ferris and some of its relatives (Homoptera: Coccoidea), H. MORRISON. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 2, pp. 38–55, illus. 61).—This taxonomic study includes a key to species of the mealybug genus *Heterococcus* (three new) and a key to *Heterococcus* and associated genera (two of the latter described as new).

The genus *Laccocera* Van Duzee (Homoptera: Delphacidae), L. R. PENNER. (Univs. Kans. and Minn.). (*Jour. Kans. Ent. Soc.*, 18 (1945), No. 1, pp. 30–47, illus. 28).—Taxonomic study of this genus of fulgorid leafhoppers, provided with a key for identification and involving new nomenclature.

Contributions to the knowledge of the Psyllidae of Mexico, L. D. TUTHILL. (Iowa State Col.). (*Jour. Kans. Ent. Soc.*, 17 (1944), No. 4, pp. 143–159; 18 (1945), No. 1, pp. 1–29, illus. 93).—Previously recorded knowledge of the Mexican forms of the jumping plant-lice family of Homoptera is said to be very incomplete. The present study includes keys to the genera and species and much new taxonomy, an attempt being made "to furnish a solid foundation for further work by resolving some of the confusion concerning the named forms and providing keys to the entities now known to occur in this area."

Zur Kenntnis der Hyperparasiten von *Pieris brassicae* L.—I, *Mesochorus pectoralis* Ratz. und seine Bedeutung für den Massenwechsel des Kohlweisslings [The hyperparasites of *P. brassicae*.—I, *M. pectoralis* and its significance in the mass fluctuations of cabbage butterflies], H. BLUNCK (*Ztschr. Angew. Ent.*, 30 (1944), No. 3, pp. 418–491, illus. 11).—The hosts of *Mesochorus* spp. are first considered, following which the bulk of the monograph is taken up with *M. pectoralis*—its morphology, hosts, geographical distribution, breeding and investigation methods, behavior of the adults, larval stages, number of generations, and its relative influence on the populations of *Apanteles glomeratus* L. and *P. brassicae* in

comparison with other limiting factors. The following general picture came out of the study: On the average, 60 percent of the caterpillars of *P. brassicae* are destroyed by *A. glomeratus*. Of the latter, up to about 80 percent fall victim to other Hymenoptera. Of these, 75 percent belong to the chalcid flies and 25 percent to the ichneumon flies, the former being distributed among at least 36 and the latter among about 48 species of highly differing frequency. *M. pectoralis* belongs to the less frequent but not markedly rare forms; it exercises no practical influence on the populations of *A. glomeratus* and thus is of no economic importance in relation to *P. brassicae*. There are five pages of references.

Fat inclusions in blood cells of the southern armyworm (*Prodenia eridania* (Cram.)), S. C. MUNSON and J. F. YEAGER. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 37 (1944), No. 4, pp. 396-400, illus. 2).—The hemocytes of larvae reared on collard leaves alone contained practically no fat inclusions before the prepupal stage; they first appeared in that stage, were found in the pupa at all times, and practically disappeared in the first part of the imaginal stage. In general, fat appeared and continued to be found in the hemocytes as glycogen disappeared therefrom; fat droplets, as well as liberated adipose cells, were present in the plasma during metamorphosis. The hemocytes of sixth or earlier instars may contain fat inclusions if the larvae ingest sufficient fat, such as butter or olive oil, in their diet. Like glycogen counts, hemocyte fat counts represent frequency distributions; they tended to have the form  $0 > 1 > 2 > 3 < 3+$  and to exhibit a maximum in a higher class as the fat index increased.

*Herse cingulatus* Fab. as an armyworm, J. R. WATSON (*Fla. Ent.*, 27 (1944), No. 3, p. 58).—A case is reported of caterpillars of this moth assuming the habit of armyworms and destroying sweetpotato vines in Alachua County, Fla.

The recent introduction of armyworm parasites from Texas, F. A. BIANCHI (*Hawaii Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], 48 (1944), No. 3, pp. 203-212, illus. 2).—The following six parasitic wasps, introduced into Hawaii from Texas, are discussed in relation to armyworms: *Chelonus texanus* (Cress.), *Neopristomerus appalachianus* Viereck, *Perisierola* sp., *Meteorus laphygmae* Viereck, *Rogas laphygma* Viereck, and *Apanteles marginiventris* (Cress.). This contribution is intended to familiarize plantation men with the important aspects of these parasites.

Observations on the life history of *Apamea velata* Wlk., V. G. DETHIER (*Canad. Ent.*, 76 (1944), No. 11, pp. 223-225, illus. 5).—Brief notes on the life history and descriptions of the last instar and pupa of this widespread noctuid moth, the larvae of which are grass feeders.

1940 supplement to the Coleoptera found living in and on various fungi, H. C. MOENNICH (*Bul. Brooklyn Ent. Soc.*, 39 (1944), No. 5, pp. 164-170).—An annotated list.

A few additions and corrections to R. E. Blackwelder's "Checklist of the Coleopterous Insects of Mexico, Central America, the West Indies, and South America, Part I," H. B. LEECH (*Ent. News*, 55 (1944), No. 10, pp. 266-268)—Supplementary to the check list previously noted (E. S. R., 91, p. 175).

The Mexican bean beetle in Maine, J. H. HAWKINS (*Maine Sta. Bul.* 431 (1944), pp. 205-231+, illus. 27).—A practical account of the biology and control of this pest, which first appeared in the southwestern part of the State in 1930.

Five new flea beetles from the West Indies, D. H. BLAKE (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 3, pp. 89-92, illus. 5).—One new species each of *Hadropoda* and *Oedionychis* and three of *Pseudoepitrix* are described.

Wireworms and war-time farming, H. W. MILES (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 51 (1945), No. 10, pp. 462-468).—A general discussion of the wireworm menace, with recommendations for control.

Nutritional requirements of Camponotus ants, F. SMITH. (Univ. Tenn.). (*Ann. Ent. Soc. Amer.*, 37 (1944), No. 4, pp. 401-408).—Qualitative differences in the food given to colonies of the black carpenter ant were found to influence to a greater or less degree the stature, weight, and number of the progeny produced. Diets rich in protein had a deleterious effect on the progeny. A salt mixture known to be adequate for vertebrates proved harmful to the ants. Absence of fat from the diet did not influence the progeny. Colonies were sensitive to a vitamin-deficient diet, the imagines produced being smaller in stature and fewer in number; it is concluded that the bacterial flora known to be present in the gut of the nurse ants and their larvae elaborates vitamins in sufficient amounts to permit larval development, albeit somewhat abnormally.

The ants of the Chicago region, R. E. GREGG (*Ann. Ent. Soc. Amer.*, 37 (1944), No. 4, pp. 447-480, illus. 7).—Selected localities representing 16 major habitats were investigated repeatedly in obtaining the data for the discussion and the copiously annotated listing of the ants of this area here presented. Keys for the identification and a one and one-half page bibliography are included.

An observation of ants killing a larva of the Japanese beetle, J. L. WILLIAMS (*Ent. News*, 56 (1945), No. 1, pp. 6-7).—The pavement ant was the species concerned.

The Aphidiinae of North America (Braconidae: Hymenoptera), C. F. SMITH (*Columbus: Ohio State Univ.*, 1944, pp. 154+, illus. 148).—Nearly every aphid species is attacked to a greater or less extent by parasites. The hymenopterous parasites may be divided into primary and secondary groups. The primary parasites are subdivided into the family Aphelinidae (superfamily Chalcidoidea) and the subfamily Aphidiinae (family Braconidae, superfamily Ichneumonoidea). The present volume deals only with the Aphidiinae. Keys for identification are included, and new taxonomy is involved. An index to genera, subgenera, and species is provided.

Notes and records of the eastern representatives of the Photopsidine genera of Mutillidae with descriptions of new forms, R. M. SCHUSTER. (Cornell Univ.). (*Bul. Brooklyn Ent. Soc.*, 39 (1944), No. 5, pp. 139-156).—This survey was undertaken to bring the very fragmentary knowledge of the Photopsidine wasps of the eastern United States up to date, to introduce keys utilizing characters not heretofore used, and to describe several new forms.

Mites of the genus *Tenuipalpus* (Acarina: Trichadenidae), E. W. BAKER. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 2, pp. 33-39, illus. 12).—Of the six species of these plant-feeding mites here considered, four are described as new.

A new genus of scorpions in the Southwest, S. MULAIK and H. G. HIGGINS (*Ent. News*, 55 (1944), No. 9, pp. 237-240, illus. 9).—*Diplops desertorum* n. gen. and sp. is described and tentatively assigned to the family Chactidae.

Statement on DDT by the American Association of Economic Entomologists (*Ent. News*, 56 (1945), No. 2, pp. 38-39).

• The metabolism of 2,2 bis(p-chlorophenyl) 1,1,1 trichloroethane (DDT).—I. A metabolite from rabbit urine, di(p-chlorophenyl)acetic acid, its isolation, identification, and synthesis, W. C. WHITE and T. R. SWEENEY (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 3, pp. 66-71, illus. 2).—Fed to rabbits, DDT yielded di(p-chlorophenyl)acetic acid in the urine; its isolation and synthesis are described as well as the degradation of DDT in vitro. A possible mechanism for the degradation of DDT in vivo is suggested.

DDT experiments in Virginia, W. S. HOUGH. (Va. Expt. Sta.). (*Va. Fruit*, 33 (1945), No. 1, pp. 183-191).—A brief summary of the results of apple orchard tests in 1944.

**DDT toxicity:** A report on the toxicity to warm-blooded animals of aerosols, mists, and dusting powders containing DDT, P. A. NEAL (*Soap and Sanit. Chem.*, 21 (1945), No. 1, pp. 99-101, illus.).—An address summarizing the results of experimental tests.

**Postwar uses for DDT,** F. C. BISHOPP. (U. S. D. A.). (*Soap and Sanit. Chem.*, 21 (1945), No. 2, pp. 109-111).

Mineral oils, alone or combined with insecticides, for control of earworms in sweet corn, G. W. BARRER (U. S. Dept. Agr., *Tech Bul.* 880 (1944), pp. 83, illus. 11).—In this study of insecticidal control of the corn earworm (1935-41), exploratory work showed a medicinal mineral oil to be promising and its effectiveness correlated with the husk characters of the ears. When applied to loose interior silks, the oil tended to run through them, but in more tightly packed silks it remained as a film about the silk strands, forming a saturated barrier in which the larvae were smothered. The efficiency of the oil was increased by adding pyrethrins, a 0.2-percent solution proving most practical in both cost and rate of control. Further study showed dichloroethyl ether (2 percent by volume) to be nearly as effective as oil-pyrethrins and much less expensive. Oils of 125-210 sec. viscosity (Saybolt) gave best results. As sampled by 372 persons, no detectable residue was found on ears treated with oil-pyrethrins, but the tips of a few treated with the oil-dichloroethyl ether bore a residue of this material. When applied to unpollinated silks, mineral oil interfered with fertilization, but delaying treatment until several days after silk exposure usually overcame this difficulty. Germination of sweet corn kernels was not affected by the oil treatment. Single applications at the rate of 0.75 cc. per ear, using force oilers attached to knapsack tanks holding 1 gal., protected 75 percent or more of ears under average growing conditions. Though treatment may prevent the development of a few kernels at the tips, commercial applications showed that consumers are willing to pay higher prices for worm-free ears, thus rendering the control measure profitable to growers.

**Fighting the apple fruit fly,** F. H. LATHROP (*Maine Sta. Misc. Pub.* 587 (1944), pp. 7+, illus. 2).—The apple maggot is reported to have been for many years one of the most destructive insect pests in Maine orchards. Although apples are preferred, other orchard fruits such as plums, pears, and possibly cherries are attacked to a limited extent. Early apples are preferred. Wild fruits such as thorn apples and Juneberries growing near the orchard may serve as important sources of infestation; the blueberry form appears to shun apples. The seasonal cycle of the insect and recommended control methods are summarized. Placing infested fruit in cold storage before the larvae have done material injury is said to prevent further development of the pest. A list of 16 references is appended.

The identity of a borer attacking peach trees in the Okanagan Valley of British Columbia, E. P. VENABLES (*Canad. Ent.*, 76 (1944), No. 11, p. 232).—The borer active against peach trees in this area was identified as *Sanninoidea gracilis* (Beut.) instead of *S. exitiosa* (Say) as had hitherto been assumed.

A comparison of acid and basic arsenate of lead on peach for plum curculio, W. J. SCHOENE (Va. Expt. Sta.). (*Va. Fruit*, 33 (1945), No. 1, pp. 165-169).—Acid lead arsenate proved more effective against plum curculio and also caused more damage to the fruiting-peach wood than the basic material; use of  $ZnSO_4$  and lime reduced the injury. In this test basic lead arsenate without lime also caused some injury to the foliage and serious damage to the wood. Recommendations are given.

O emprêgo da argila e do enxôfre como repulsivos na luta contra o *Dacus oleae* Gmel. [Employment of clay and sulfur as repellents for control of the olive fruitfly], J. E. BAPTISTA (*Agron. Lusitana*, 5 (1943), No. 1, pp. 57-66, illus. 2; Eng. abs., pp. 65-66).—Control methods against the olive fruitfly usually in-

clude the use of attractants which kill the adult insect. It is often important, however, to treat larger areas, since reinfestations from outside are always to be feared. In the present investigation, sulfur and clay were used as repellents—the first as a dust and the second as a spray mixed with  $\text{CuSO}_4$  and  $\text{Pb}_3(\text{AsO}_4)_2$ . Three applications (July, August, October) resulted in 6 percent infested fruits as compared with over 51 percent on the untreated trees.

O valor da colheita precoce da azeitona como método preventivo de combate ao *Dacus oleae* Gmel. [The value of early picking of olives as a preventive method of combating the olive fruitfly], A. R. DE AZEVENO (*Agron Lusitana*, 5 (1943), No. 1, pp. 83-89, illus. 1; Eng. abs., p. 88).—In late harvesting of olives in Portugal the fruitfly maggots escape destruction by leaving the fruits and pupating in the ground. It was thus suggested that by harvesting early the larvae would be destroyed by the methods used in extracting the oil. Later it was shown that when the fruits were picked early the larvae pupated readily and the adults emerged before winter, thus preventing passage of the pupal stage through the winter; in this case it is the adult that passes the winter and the numbers left to continue the infestation during the following season are much reduced. Field observations in Sacavém (1941-42) indicated that harvesting the fruits up to mid-October—when they are fairly ripe—brought about the emergence of all the adults during the following months.

Le peuplement entomologique du rosier [The insect inhabitants of rose bushes], R. HARDOUTIN (Paris: Presses Universitaires de France, 1943, pp 382+).—This monograph first presents brief accounts of the history of the rose, its botanical species, and the roses cultivated in France; then takes up in separate sections the insects attacking the wood, shoots, foliage, and leaves; and finally considers the ecological relationships, including the factors involved in natural control. A systematic catalog of the insects affecting the rose, a bibliography of six pages, and a list of publications by the author complete the work. The preface is by M. Caullery.

Relative susceptibility of enriched and nonenriched flours to insect attack, R. T. COTTON, J. C. FRANKENFELD, and E. G. BAYFIELD. (U. S. D. A. and Kans. Expt. Sta.). (*Northwest Miller*, 221 (1945), No. 7, Sect. 2, pp. 3a, 23a).—On the basis of the cooperative studies reported, it is concluded that flour beetles are probably not attracted to enriched more than to nonenriched bakers' flour. The larvae did not grow at a significantly faster rate in the enriched flour, but in a given period of time the beetles produced many more progeny; this increase in reproduction in the enriched over the nonenriched flour was found due to the added riboflavin. It may therefore be assumed that insect control constitutes a more serious problem in the storage of flour enriched with this vitamin than in that of nonenriched flour.

Effect of potassium fluoride and pyrethrum on *Periplaneta americana* (L.) after hemocytes are blocked with Chinese ink or nephrocytes are stained with trypan blue, E. R. McGOVAN, J. F. YEAGER, E. L. MAYER, and S. C. MUNSON. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 37 (1944), No. 4, pp. 414-419, illus. 4).—Nymphs of the American cockroach were injected with Chinese ink or trypan blue in saline and then poisoned by externally applied KF in water or pyrethrum in acetone to determine whether the injections affected resistance to poisons. The carbon particles lowered the resistance to KF for a time during the first half of the observation period but caused a marked rise by the end; such injection also appeared to increase the resistance to pyrethrum slightly, though not significantly. The trypan blue injections apparently failed to change the resistance to either KF or pyrethrum. Some observations on activity and molting are presented and discussed.

**Roach control tests**, G. E. GOULD. (Ind. Expt. Sta.). (*Soap and Sanit. Chem.*, 21 (1945), No. 2, pp. 113-115, 121).—Sodium fluoride dust for all species of roaches and phosphorus paste for the large species are said to be still the standard treatment for these pests, but when these are unavailable or nonusable because of the health hazard one of the new materials may be successfully substituted. In laboratory tests boric acid was found to give a better kill than borax and with added pyrethrum marc proved a satisfactory roach powder. The marc alone killed few roaches but did improve the performance of boric acid, dinitroanisole, and sodium fluoride. A mixture of 15 parts dinitroanisole with 85 parts pyrethrum marc or one containing 10 parts dinitroanisole and 45 parts each of pyrethrum marc and boric acid gave much promise and should be given further trial. Two commercial roach powders gave good results in laboratory tests, but a number of synthetic organics proved of little value. Results with DDT were promising in the laboratory, but more research is needed before it can be recommended.

**Notes on fleas (Siphonaptera) in Nebraska**, D. B. GATES. (Nebr. Expt. Sta.). (*Ent. News*, 56 (1945), No. 1, pp. 10-13).—An annotated list of the Nebraska fleas now in the collection maintained by the university. Since relatively little work has been done on ectoparasites in the State, it may represent only a small proportion of the species there present.

**A new mouse flea**, *Pleochaetoides bullisi*, n. gen. n. sp., from Texas, G. F. AUGUSTSON (*Jour. Parasitol.*, 30 (1944), No. 6, pp. 366-368, illus. 4).—The new genus and species are described and illustrated and said to be closely allied to *Pleochaetus* Jordan.

**A note on the conditions of pupation of *Musca domestica vicina* (Diptera) in Palestine and its application**, B. FELDMAN-MUHSAM (*Roy. Ent. Soc. London, Proc., Ser. A*, 19 (1944), No. 10-12, pp. 139-140).

**An interesting occurrence of *Musca domestica* L. larvae in infant bedding**, R. K. CHAPMAN (*Canad. Ent.*, 76 (1944), No. 11, pp. 230-232).—Discussion of this occurrence leads to the conclusion that the housefly can definitely come through its entire life cycle with no other nutrient than human urine, that it probably will not lay its eggs on surfaces dampened with water alone and containing no nutritive materials, and that the apparent increase in infestations of the larvae in infant bedding is possibly due to the shortage of rubber sheeting and the consequent increased wetting of the bedding by urine.

**Use of sodium arsenite in fly control**, E. R. HERING (*U. S. Naval Med. Bul.*, 44 (1945), No. 2, pp. 432-434).—In the tests reported, spraying experimental shoulders of mutton or cadavers with 2 percent sodium arsenite not only prevented the development of fly maggots present but also killed adult flies feeding thereon. Instructions for use are included.

**The effects of subzero temperatures on *Hypoderma lineatum* DeVill.** R. W. SALT (*Sci. Agr.*, 25 (1944), No. 3, pp. 156-160, illus. 1).—It is concluded from this study that in Alberta there is little chance that early dropped larvae of the common cattle grub will be frozen and killed; to the stockman this means that early spraying may be necessary. However, there are indications that many, if not all, of the early dropped grubs are immature forms, and that these are incapable of maturing; further study of this aspect of the problem is of urgent practical importance.

**Development of a powder treatment for the control of lice attacking man**, R. C. BUSHLAND, L. C. McALISTER, JR., G. W. EDY, H. A. JONES, and E. F. KNIPPLING. (U. S. D. A.). (*Jour. Parasitol.*, 30 (1944), No. 6, pp. 377-387, illus. 3). Test methods for the laboratory evaluation of insecticides against the body louse are described, including procedures for beaker tests, arm-and-leg tests, ovicide tests, and tests on grossly infested men. The development of an effective louse powder—

MYL formula—for use by the armed forces is also described; it consists of 0.2 percent pyrethrum as a toxicant, 2 percent IN-930 as a synergist, 0.25 percent Phenol S as an antioxidant, and 2 percent of 2,4-dinitroanisole as an ovicide, with pyrophyllite as an inert diluent. This powder did not readily deteriorate even under unfavorable storage conditions. Laboratory comparisons by the arm-and-leg method and tests on grossly infested men indicated the MYL formula to be a superior louse powder. When uniformly applied over the entire inner surface of winter underwear (30 gm. per suit) worn by heavily infested men, it killed all body lice present at time of treatment and all eggs with which it came in contact and gave complete protection against introduced lice for at least a week. The powder also proved effective against both head and crab lice and is being employed successfully by troops in war theaters against other important insects such as fleas, bed-bugs, and ants.

The trombiculid mites (chigger mites) and their relation to disease, H. E. EWING. (U. S. D. A.). (*Jour. Parasitol.*, 30 (1944), No. 6, pp. 339-365, illus. 8).—This is an address considering the life histories of the group, present knowledge of the life cycle of the chigger and its geographical distribution along with that of three species of *Trombicula*, a revised classification of the larvae of the trombiculid mites (Trombiculidae), direct injury to hosts by trombiculid larvae, relation of these mites to tsutsugamushi disease, wartime investigations in the South Pacific and the danger of spreading this disease because of war conditions, principles of control for the trombiculid mites, and present and future problems concerning the group. There are about five pages of references.

A bibliography pertaining to the mite family Trombidiidae, R. W. WILLIAMS (*Amer. Midland Nat.*, 32 (1944), No. 3, pp. 699-712)—The interest in certain representatives of this group has increased greatly, and research on those forms parasitic on man has received considerable stimulus because of the significant role they play in the lives of military personnel. This bibliography includes 375 references.

A preliminary revision of the scutellaris group of the genus *Aedes*, D. S. FARNER and R. M. BOHART (*U. S. Naval Med. Bul.*, 44 (1945), No. 1, pp. 37-53, illus. 15).—A systematic revision and a table for preliminary field identification of the known Australasian species of this group of mosquitoes are presented. Careful study of about 1,000 specimens from Melanesia, Micronesia, and Polynesia appears to show that the distribution of *A. pseudoscutellaris* is Polynesian only, and that its range plus the range of *A. tongae* is coincident with that of nonperiodic filariasis.

Description of 4th-instar larvae of *Aedes (Mucidus) grahami* Theobald (Diptera), G. W. SHIELD (*Roy. Ent. Soc. London, Proc., Ser. A*, 19 (1944), No. 10-12, pp. 129-130, illus. 1).

The effect of ground temperature inversions upon the flight activity of *Culex* sp. (Diptera: Culicidae), W. G. WFLLINGTON (*Canad. Ent.*, 76 (1944), No. 11, p. 223).—A certain stratification of the flight levels of the sexes correlated with a layering of the air temperature is reported, the ♀ of *Culex* sp. having a lower minimum flight temperature than the ♂.

Check list of Dixidae of the world, J. L. COOPER and W. F. RAPP, JR. (*Canad. Ent.*, 76 (1944), No. 12, pp. 247-252, illus. 1).—An annotated list of culicid mosquitoes of the genera *Dixia* and *Neodixia*.

The male and larva of *Psorophora (Janthinosoma) horrida* (Dyar and Knab) and a new species of *Psorophora* from the United States (Diptera: Culicidae), L. M. ROTH (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 1, pp. 1-23, illus. 19).—Taxonomic, descriptive, and field data are presented on these mosquitoes.

New Jersey Mosquito Extermination Association, thirty-first annual meeting (*N. J. Mosquito Extermin. Assoc. Proc.*, 31 (1944), pp. 198+, illus. 18).—Among the contributions presented at the annual meeting held at Atlantic City in March

1944 (E. S. R., 90, p. 232) are the following: A Review of Contributions to the Knowledge of Mosquitoes Made During 1943 in a World at War, by F. C. Bishopp and H. H. Stage (pp. 7-29) (U. S. D. A.); Aerial Photography for Mosquito and All Sanitation Problems, by C. M. Hodell (pp. 29-31); *Anopheles quadrimaculatus* in Northeastern United States, by R. C. Barnes and H. L. Fellton (pp. 48-51); The Mosquito Problem, the Progress That Has Been Made Towards Its Solution, and the Probable Future of Anti-mosquito Work in Cape May County, by A. L. Lafferty (pp. 56-68); A Summary of Mosquito Control Work in New Jersey in 1943, by T. D. Mulhern (pp. 72-98), Research With Mosquito Larvicides on Mosquitoes and Fish in 1943, by J. M. Ginsburg (pp. 102-104), Mosquito Control, an Important Factor in the Life and Progress of the State of New Jersey, by W. H. Martin (pp. 138-141), Improved Methods of Rearing *Aedes aegypti* Mosquitoes for Use in Repellent Studies, by P. Granett and H. L. Haynes (pp. 161-168), and "Paired Product Testing" for the Evaluation of Mosquito Repellents, by P. Granett (pp. 173-178) (all N. J. Stas.); Mosquitoes Caught in Back Yards of Poliomyelitis Cases in Chicago During the Infantile Paralysis Epidemic of 1943, by J. L. Clarke (pp. 105-111); Florida's East Coast Counties—Unified Program for Mosquito Control and Its Problems, by V. S. Minnich (pp. 111-113); Methods Employed to Overcome the Effects of War-Time Shortages So That Progress in Mosquito Control Could Be Made in Massachusetts, by E. Wright (pp. 113-115); A Formula for Elimination of Mosquitoes of Mutual Concern to Military and Civilian Agencies—Careful Planning, Plus Cooperation, Equals Gratifying Progress, by L. W. Smith (pp. 123-124); Outstanding Features of the Mosquito Control Work of the United States Army in 1943, by W. A. Hardenbergh (pp. 126-128); Some Practical Suggestions for the Rearing of *Aedes aegypti* (Linn.), by H. L. Trembley (pp. 168-172); and Anti-mosquito Work in the Second Service Command, by J. V. Osmun (pp. 179-182).

Weitere Beobachtungen zur Lebensweise der Kiefernschonungsgespinstblattwespe, *Acantholyda erythrocephala* L. [Further observations on the life cycle of the pine sawfly *A. erythrocephala*], F. SCHWERDTFEGER (*Ztschr. Angew. Ent.*, 30 (1944), No. 3, pp. 364-371).—Data are presented on the phenology of this hymenopteran leaf-eater, on the egg, larva, and adult stages, and on the length of the life cycle.

Wood-boring beetles in South Africa: Preventive and remedial measures, F. G. C. TOOKE and M. H. SCOTT (*Union So. Africa Dept. Agr. and Forestry Bul.* 247 (1944), pp. 37+, illus. 25).—The beetles attacking green or freshly felled wood and those attacking seasoned wood only are considered separately. To the first group belong the pinhole borers or ambrosia beetles of the family Platypodidae; the most important pest species of the second group are comprised in the families Bostrichidae, Lyctidae, Anobiidae, and Cerambycidae.

Der natürliche Schutz des Laubholzes gegen Hausbockkäferlarven und seine Ursache [Natural protection of hardwoods against the old house borer and its bases], G. BECKER (*Ztschr. Angew. Ent.*, 30 (1944), No. 3, pp. 391-417, illus. 4).—Experiments on the means by which the wood of deciduous trees may be protected against attack by this cerambycid beetle.

Producción y comercio apícola en la República Argentina [Commercial and production aspects of apiculture in Argentina], P. A. DE SARASQUETA (*Buenos Aires Univ. Inst. Zootech. [Pub.]*, 2 (1944), No. 4, pp. 65, illus. 7; Eng., Portug. abs., pp. 62-65).

Note on the habits of *Osmia georgica* Cresson as ascertained by the glass-tube method, C. G. PAUL, and PHILIP HARTMAN and C. RETTENMEYER (*Psyche*, 51 (1944), No. 3-4, pp. 162-165).—Notes on the domestic activities of this bee, in-

cluding the manner of making the "beebread" and laying the egg upon the accumulated mass, are given as based on observations made through the transparent walls of the tube.

A creeping legume: A new forage crop named by Iowa Beekeepers Association "pellet clover" (*Amer. Bee Jour.*, 85 (1945), No. 2, pp. 47-48, illus. 3).—On *Trifolium ambiguum*, a perennial clover introduced from the Caucasus and Romania, and reported to have shown great promise as bee pasture in the tests reported.

## ANIMAL PRODUCTION

The effect of feed on the critical temperature for the albino rat, R. W. SWIFT. (Pa. Expt. Sta.). (*Jour. Nutr.*, 28 (1944), No. 5, pp. 359-364, illus. 1).—Determination of heat production of six albino rats on a ration of high dynamic effect and during fast at environmental temperatures from 15° to 34° C. showed the zone of thermal neutrality for the fasting rat to be from 28° to 33°. Feed lowered this range about 1°. About one-third of the heat increment observed in the zone of thermal neutrality was shown below the critical temperature. With feeding, results were similar to those previously reported (E. S. R., 82, p. 231).

Commercial feeding stuffs, September 1, 1943, to August 31, 1944, F. D. BROCK, M. P. HOLLEMAN, and F. D. FULLER (*Texas Sta. Bul.* 660 (1944), pp. 168).—In addition to the usual report of the guaranteed and found analyses of feeds officially inspected for the year ended August 31, 1944 (E. S. R., 91, p. 728), data for special feeds show the carotene content, hardness of cottonseed cake, and carbonate of lime and salt in mixed feeds.

Cattle wintering, grazing, and fattening tests are conducted in eastern Colorado, W. E. CONNELL and R. C. TOM (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 1, pp. 10-13, illus. 4).—Tests with steer calves are reported.

Sorghum silages and dehydrated alfalfa leaf meal as sources of carotene in beef cattle fattening rations, J. H. and J. M. JONES, G. S. FRAPS, A. R. KEMMERER, R. E. DICKSON, C. E. FISHER, and N. R. ELLIS. (Coop. U. S. D. A.). (*Texas Sta. Bul.* 659 (1944), pp. 27, illus. 7).—Study is reported of the comparative value of carotene from dehydrated alfalfa leaf meal, grain sorghum silage, and sweet sorghum silage for fattening steers in two dry-lot feeding trials. Approximately 2,000 µg. of carotene daily per 100 lb. live weight were provided from the three sources in both these trials, using 3 lots of 10 steers each, fed for 196 days. Steer calves averaging 330 lb. were used in the first trial, and 570-lb. yearlings in the second, for comparing these sources of carotene during the last 147 days. Data were kept on the length of time required for development of night blindness, measured at weekly intervals after 60 days by methods previously described (E. S. R., 90, p. 819), its degree, and the carotene and vitamin A content of the livers and blood plasma.

Although the sorghum silages showed much variation in their carotene content, sorghum silage contained more carotene per pound in natural state, although higher in moisture, than grain sorghum silage. In the first experiment 1 lb. of sweet sorghum silage averaged as much carotene as 1.9 lb. of grain sorghum silage, but it varied during the feeding period, so that toward the end the relation became 1 lb. to 4.5 and the calves could not consume enough grain sorghum silage to obtain 2,000 µg. of carotene. This amount did not prevent night blindness in either experiment. Advanced symptoms of vitamin A deficiency were observed in the calves on the 196-day test, whereas the yearlings were less seriously affected in the second experiment, although the condition was evident. Both calves and steers were less affected, and there was more carotene in the blood plasma and liver, when dehydrated alfalfa leaf meal was fed than on the silages.

In general, the results in gain, finish, and marketability of the steers showed that either kind of silage may supply sufficient carotene to prevent injury in fattening rations from vitamin A deficiency. Judging by night blindness and other external evidences of vitamin A deficiency, blood plasma and liver carotene appeared to be equally reliable, and more reliable than the spectro-vitamin A content of the liver as indicators of degree of vitamin A deficiency. A higher content of vitamin A and carotene in the liver and plasma was found in the steers with alfalfa than in the silage groups. It appeared that a slight degree of night blindness occurred in groups averaging 1 p. p. m. plasma carotene, but in the first experiment marked symptoms of vitamin A deficiency occurred when the carotene content of blood plasma averaged 0.28 p. p. m. Ill effects of vitamin A deficiency were prevented, and the carotene values indicated that 1 lb. of good quality sweet sorghum silage daily per hundredweight prevented vitamin A deficiency in fattening periods of about 200 days. From 2 to 3 lb. of good quality grain sorghum silage may be necessary to yield the same result. Both silages in these amounts yielded ample protection.

**Superphosphate and basic slag poisonous to cattle,** J. W. SCALES (*Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 2, pp. 1, 7*).—Cases of inflammation of the abomasum and some death losses were noted in two herds having access to broken bags of superphosphate or basic slag.

**Effect of pregnancy on quality of beef,** R. R. SNAPP and S. BULL (*Illinois Sta. Bul. 508 (1944), pp. 429-452, illus. 7*).—Study was made of the effect of pregnancy on the quality and efficiency of beef production. A group of 10 Hereford heifers was paired for feeding by the method of Armsby (E. S. R., 46, p. 764). One-half of these heifers were bred when they came into heat and both heifers of each pair were fed for 150 days. In general, bred heifers had better appetites than open heifers, but there was no significant difference in the rates of gain. The carcasses of the bred heifers were noticeably better finished, but otherwise there was no significant difference in the carcass grade. The loin ends of the open heifers were 7 percent heavier than those of the bred heifers, and the rounds were 11 percent heavier, but otherwise there were no significant differences in the cutting percentages. Carcasses of the bred heifers contained 20 percent more fat and 5 percent less lean, with 10 percent less bone than those of the open heifers, indicating that pregnancy shortens the time required to obtain satisfactory market finish. Although pregnancy had no effect on the color of the lean, the back fat of the bred heifers was slightly softer.

**Vitamin A content of sheep's colostrum and milk,** G. H. SATTERFIELD, R. E. CLEGG, and A. D. HOLMES. (*Mass. Expt. Sta. et al. (Food Res., 9 (1944), No. 3, pp. 206-211)*).—The average vitamin A content of the colostrum and milk obtained from ewes producing lambs which grew to maturity was 10.11, 6.88, 3.98, 3.37, 2.70, 1.03, and 1.10 Lovibond units per gram, respectively, for the first 7 days of lactation. The vitamin A content of the milk was even lower during the second and third weeks of lactation. The ewes which were 2 and 3 weeks old were maintained on lespedeza and native grass pasture during the summer before lambing, and in December and January received soybean hay and soybeans. A mixture of corn, oats, wheat bran, and cottonseed meal was fed after lambing. There were 15 ewes in the study.

**The amino acid requirements of the chick,** H. J. ALMQVIST and C. R. GRAU. (Univ. Calif.). (*Jour. Nutr., 28 (1944), No. 5, pp. 325-331, illus. 3*).—A complete replacement of protein was made by a mixture of 20 amino acids with 3-4 chicks by methods previously noted (E. S. R., 92, p. 102). In each experiment glucose replaced the omitted amino acids except for glutamic acid, where aspartic acid was added. Of the amino acids used, alanine, aspartic acid, hydroxyproline, proline,

norleucine, and serine were found to be dispensable. Glycine proved to be essential for promoting the best growth, and glutamic acid had a similar action. Tyrosine was required when only moderate levels of phenylalanine were used, but was dispensable with higher levels of this product. To prevent weight loss, leucine, phenylalanine, threonine, and valine were found to be necessary dietary components, and the similar status of histidine and isoleucine was confirmed.

**Growth in chicks fed amino acids.** D. M. HEGSTED (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 247-252, illus. 1).—Day-old White Leghorn chicks were fed a commercial chick starting ration for 6-7 days when they weighed 60-70 gm. Following this period they were fed a low-protein basal ration for 3 days, when they lost 1-5 gm. in weight. A group of 12 amino acids consisting of leucine, isoleucine, threonine, phenylalanine, valine, methionine, tryptophan, cystine, arginine, lysine, histidine, and glycine as the only substantial sources of nitrogen allowed growth but much less than a comparable level of adequate protein. When leucine, isoleucine, threonine, phenylalanine, or valine were omitted, there was failure in growth and loss in weight, but slight growth and maintenance of weight were possible when glycine was omitted. Evidently leucine, isoleucine, threonine, phenylalanine, and valine are essential amino acids for the chick. Glycine is required for normal growth.

**Directory of U. S. Register of Merit sires and dams qualifying under the National Poultry Improvement Plan, 1942-43.** P. B. ZUMBRO, A. B. GODFREY, ET AL. (*U. S. Dept. Agr., Misc. Pub.* 557 (1944), pp. 54+).—These lists (E. S. R., 91, p. 62) are grouped by breeds and breeders.

## DAIRY FARMING—DAIRYING

**Sweet potato vine silage.** (Coop. U. S. D. A.). (*North Carolina Sta. Spec. Cir.* 3 (1944), pp. [4], illus. 1).—A good silage can be made from sweetpotato vines pulled by hand and chopped in a silage cutter. Three silos were filled—one with vines alone, a second with a mixture of vines and roots, and a third with vines and molasses at the rate of 60 lb. of molasses per ton of vines. The vines must be harvested before frost. Good silage has a mild aroma similar to sauerkraut. The silage should be well packed. It provides carotene in the winter feed, which is ordinarily deficient. In 3 years' tests, sweetpotato vine silage has been found as good as corn silage in the dairy ration for maintaining body weight and milk production. The size of the silo should depend upon the size of the herd, with 2 in. for 3 sq. ft. being taken off per day.

**The effect of roughage intake upon the fat content of milk.** J. K. LOOSLI, H. L. LUCAS, and L. A. MAYNARD. (Cornell Univ.). (*Jour. Dairy Sci.*, 28 (1945), No. 2, pp. 147-153, illus. 1).—When 20 Holstein-Friesian cows in three experiments were fed less than 5 lb. of hay and sufficient grain mixture to satisfy their energy requirements, the fat content of the milk and milk yield were reduced as compared with similar cows fed an average of 12 lb. of hay, 30 lb. of corn silage, and small amounts of a grain mixture. The importance of rumen fermentation in the production of milk and milk fat in dairy cows is discussed, largely in confirmation of the findings of Powell (E. S. R., 85, p. 519).

**The effect of two different methods of feeding cod-liver oil on fat test in milk.** L. A. MOORE, G. T. HOFFMAN, and M. H. BERRY. (Md. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 2, pp. 161-166).—There was a marked depression in the butterfat test of the milk and a large increase in the iodine number of the fat of cows fed 5-8 oz. of cod-liver oil per day in a single dose as contrasted with feeding the same amount of cod-liver oil divided into 12 doses per day. There was no such marked depression in the butterfat production or increase in the iodine

number when the dose was divided. The results indicate that some saturation takes place during digestion and absorption. In each of four experiments, the cod-liver oil was fed by these two methods to groups of cows for 3-6 days with determinations of the butterfat in the milk and the iodine number of the fat.

**Riboflavin content of milk and milk products.** L. DANIEL and L. C. NORRIS. (Cornell Univ.). (*Food Res.*, 9 (1944), No. 4, pp. 312-318; *abs. in Biol. Abs.*, 19 (1945), No. 1, p. 102).—Differences in the riboflavin content of dairy products ascertained by microbiological and fluorometric procedures were not significant. The average riboflavin contents on the fresh basis were for dried sweet-cream buttermilk 33.65 $\gamma$  per gram; dried whey 20.72; dried skim milk—spray process 19.81, roller process 18.81; dried whole milk—spray-dried 15.44, roller-dried 14.76; Cheddar cheese 4.71; condensed milk 3.95; evaporated milk (irradiated and nonirradiated) 3.57; cottage cheese 3.00; cream cheese 1.87; liquid whole milk 1.77; liquid skim milk 1.58; liquid buttermilk (cultured) 1.56; light cream 1.47; liquid whey 1.24; and butter 0.367 $\gamma$  per gram.

**The routine resazurin test as an index of the keeping quality of milk.** S. B. THOMAS and G. M. PHILLIPS (*Dairy Indus.*, 9 (1944), No. 10, pp. 699-701, 724).—A series of 250 morning-milk samples were examined during February to November by the routine resazurin test, the keeping quality of the milk at 18° C. determined by taste and clot on boiling at 4-hr. intervals, and methylene-blue reduction at 18° and at 37°, indicating that these tests with resazurin and methylene blue are indicative of keeping quality. There was good agreement between the routine resazurin test and the keeping quality. Samples held at mean atmospheric shade temperature between 40° and 50° F. had an *r* value of 0.52 as compared with 0.83 for samples held at 50° to 65°. There was a similar relationship with the methylene-blue test at 37° C. The resazurin test at 18° was as good an index of keeping quality of milk as the methylene-blue reduction test at 37°.

**Distribution of carotene and vitamin A in butter-making.** S. BERL and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 2, pp. 103-107).—Samples of milk, cream, skim milk, butter, and buttermilk were collected from the university dairy herd and analyzed for vitamin A and carotene content by modifications of methods employed in previous investigations by Olson, Hegsted, and Peterson (E. S. R., 81, p. 269). The amount of carotene and vitamin A in skim milk and buttermilk was quite small and could not be determined with great accuracy. Therefore, the values were not as trustworthy as those for milk, cream, and butter. About 70 percent of the pigment in the various products was carotene.

**Effect of various bacteria on diacetyl content and flavor of butter.** P. R. ELLIKER. (Ind. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 2, pp. 93-102, illus. 3).—A modification of the method of J. Pien, J. Baisse, and R. Martin<sup>1</sup> for

<sup>1</sup> *Lait*, 17 (1937), No. 167, pp. 673-698, illus. 1.

diacetyl determination gave practically a 100-percent recovery of diacetyl added to distilled water, but pure cultures of widely different genera of bacteria added to sterile skim milk cultures destroyed a considerable part of the diacetyl, so that the amount present after incubation for 120 hr. at 15.6° and 21° C. was considerably less than after incubation for 48 hr., although there was little change in the sterile controls. Several species of *Pseudomonas* isolated from butter and creamery water supplies destroyed diacetyl in experimental butter, thus accounting for the decrease in flavors. Butter supplies known to carry large numbers of bacteria of this type showed a pronounced loss of diacetyl during keeping quality tests. *P. putrefaciens* reduced diacetyl to acetylmethylcarbinol and 2,3-butyleneglycol. It appeared that *Streptococcus lactis* or related species were the factors responsible for inhibition of *Pseudomonas* species in butter starters. The inhibiting factor was evidently acid produced by the bacteria.

**Important factors in flavor development in butter cultures**, W. H. HOECKER and B. W. HAMMER (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 18 (1944), No. 2, pp. 267-275, illus. 3).—Studies were made of the production of various butter flavor compounds by the incubation of butter cultures in pasteurized milk at 7° and 21° C. with or without lactic acid additions. The results showed that at 21° relatively large amounts of lactic acid, acetyl methyl carbinol, and diacetyl were produced. The production of lactic acid was rapid at first, whereas the others were slower. As acidity increased, more rapid production of carbinol and diacetyl occurred, but these compounds were later destroyed. Additions of citric acid increased the carbinol and diacetyl compounds. At 7° production of lactic acid, acetyl methyl carbinol and diacetyl in butter cultures and the production of carbinol and diacetyl in cultures of flavor organisms were much slower than at 21°.

**Importance of copper in certain color changes in butter**, R. V. HUSSONG and B. W. HAMMER (*Food Res.*, 9 (1944), No. 4, pp. 289-292; abs. in *Biol. Abs.*, 19 (1945), No. 1, p. 102).—Bleaching and tallowiness in butter were frequently accompanied by high copper contents. In one instance there were blue areas on the butter before bleaching began. In experimental churning in which copper was added, usually as cupric chloride, relationship of copper to tallowiness and bleaching of the butter was apparent.

**Determination of improper pasteurization by applying the New York City field phosphatase test to Cheddar cheese**, W. J. CAULFIELD and W. H. MARTIN (Kans. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 2, pp. 155-160).—In no case did samples of Cheddar cheese with an initial negative phosphatase reaction as described by Perry and Doan (E. S. R., 85, p. 660) become positive during storage periods of 3 and 6 mo. After 6 months' storage at 60° C. there was some tendency for the phosphatase activity to diminish or become extinct. Evidently, interfering materials which might give rise to false positive tests are not a problem in using this test for Cheddar cheese. The results were based on a series of 3 independent laboratory trials, 5 semicommercial trials, and 120 different lots of Cheddar cheese.

## VETERINARY MEDICINE

**Global epidemiology: A geography of disease and sanitation**, J. S. SIMMONS, T. F. WHAYNE, G. W. ANDERSON, H. M. HORACK, ET AL. (*Philadelphia and London: J. B. Lippincott Co.*, 1944, vol. 1, pp. 504+, illus. 34).—Part 1 of this comprehensive treatise deals with India and the Far East; part 2 with the Pacific area. The arrangement is by countries, these being taken in turn for consideration as to geography and climate, public health facilities, medical facilities, and prevalent diseases. Extensive bibliographies are given for each country, that of China alone embodying over 200 entries. A series of maps showing the world distribution of the principal tropical diseases is appended.

**Inoculation of chick embryos with sporozoites of *Plasmodium gallinaceum* by inducing mosquitoes to feed through shell membrane**, V. H. HAAS and F. M. EWING (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 7, pp. 185-188, illus. 1).—The transmission of sporozoites of *P. gallinaceum* to chick embryos by allowing infectious *Aedes aegypti* mosquitoes to feed through the shell membrane and the fetal membranes immediately beneath is described, as well as the inducing of over 100 mosquitoes to engorge on embryonic blood or allantoic fluid in other experiments. The technic is deemed relatively simple, and the embryos have survived the procedure sufficiently well to make it a worth-while method for inoculating sporozoites.

**Sanitation in frozen food locker plants**, W. L. MALLMANN. (Mich. State Col.). (*Quick Frozen Foods*, 7 (1945), No. 6, pp. 80-81, 88, illus. 1).—Practical suggestions as to the requirements and how to obtain them are given.

An outbreak of typhoid fever in Alberta traceable to infected Cheddar cheese, D. B. MENZIES (*Canad. Jour. Pub. Health*, 35 (1944), No. 11, pp. 431-438, illus. 1).—An epidemic in southern Alberta in the spring of 1944 is described, in which, although *Bacillus typhosus* was not isolated from suspected cheese, the circumstantial evidence was such as to indicate infected "green" Cheddar cheese as the cause. Regulations requiring either pasteurization or the storage of cheese at least 3 mo. after manufacture were promulgated to become effective in Alberta on December 1, 1944.

An evaluation of in vitro tests in the diagnosis of virus diseases, S. E. SULKIN and E. M. IZUMI (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 1, pp. 1-5)—Following a comparison with other methods thought to present too many complicating factors to permit of general use as routine procedures, it is concluded that the complement fixation test discussed by Havens et al. (E. S. R., 88, p. 816) is eminently useful as a method of diagnosing virus diseases whether used alone or in conjunction with the neutralization test. The antigens used included, among others, those of St. Louis encephalitis, western and eastern equine encephalitis, and rabies.

Progress in the conquest of virus diseases, W. M. STANLEY (*Science*, 101 (1945), No. 2617, pp. 185-188).—This address summarizes the present status.

Le traitement des coccidioses des animaux domestiques par la Quinacrine ou Atébrine [The treatment of coccidiosis of the domestic animals with Quinacrine or Atébrine], L. C. BRUMPT (*Ann. Parasitol. Humaine et Compar.*, 19 (1942-43), No. 4-6, pp. 97-115)—Results of experiments with cats, dogs, rabbits, cattle, sheep, goats, swine, and various birds are summarized, with suggestions for effective doses.

Note on hyperprothrombinemia induced by vitamin K, J. B. FIELD and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 739-741).—It was found that the oral administration of 2-methyl-1,4-naphthoquinone to the dog, rabbit, and rat in large doses induces a state of hyperprothrombinemia, readily detected with 12.5 percent plasma, which persists for several days, depending on the dose.

Bactericidal action of antibiotic substances, S. A. WAKSMAN and H. C. RCILLY. (N. J. Expt. Stas.). (*Jour. Infect. Diseases*, 75 (1944), No. 2, pp. 150-159).—Studies of the antibiotic action of streptomycin, streptomycin, clavacin, penicillin, and chaetomin upon both gram-positive and gram-negative bacteria indicated that those antibiotic substances characterized by a high bacteriostatic activity against certain bacteria also exert a marked bactericidal action against the same organisms. Differences in the bactericidal action of antibiotic substances on different bacteria are thought to point to differences in the mode of action of these substances and in the specific sensitivity of the bacteria toward them.

Sulphonamides in veterinary practice, A. W. STABLEFORTH (*Vet. Rec.*, 57 (1945), No. 1, pp. 3-7).—This paper discusses the sulfonamides in common use, including a review of many reports of sulfonamide therapy. A summary of the ensuing discussion is appended.

Acute and subacute toxicity of DDT (2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane) to laboratory animals, G. WOODARD, A. A. NELSON, H. O. CALVERY, ET AL. (*Jour. Pharmacol. and Expt. Ther.*, 82 (1944), No. 2, pp. 152-158, illus. 2).—DDT was found to be acutely toxic by mouth to rats, mice, guinea pigs, rabbits, and chicks in doses ranging from 150 to 750 mg. per kilogram of body weight. Acute doses may produce anorexia, tremors, depression, and death. DDT was also found capable of causing subacute toxicity when given in small amounts in the diet for periods of from 3 days to 20 weeks. Definite signs of toxicity were produced by levels in the diet of 0.05 percent for rats and mice, 0.1 percent for guinea pigs, and less than 0.05 percent for growing chicks. A characteristic of its poison-

ing was the wide variation in individual susceptibility, making the estimate of a safely tolerated dose extremely difficult.

The percutaneous absorption of DDT (2,2-bis(p-chlorophenyl) 1,1,1-trichloroethane) in laboratory animals, J. H. DRAIZE, A. A. NELSON, H. O. CALVERY, ET AL. (*Jour. Pharmacol. and Expt. Ther.*, 82 (1944), No. 2, pp. 159-166)—In the animal species tested (rabbits, rats, and guinea pigs), wide individual variations in susceptibility were noted. Affected animals exhibited anorexia, severe weight loss, hyperexcitability, and nervous tremors leading to clonic convulsions. Emaciated animals became easy prey to secondary infections. Severely poisoned animals exhibited a moderate leukocytosis with a characteristic increase in the percentage of heterophiles. It is concluded that the unlimited use of DDT solutions on the skin is not free of danger; however, some solutions of DDT are deemed safe for restricted use.

Production of *Staphylococcus* strains resistant to various concentrations of penicillin, M. DEMEREC (*Natl. Acad. Sci. Proc.*, 31 (1945), No. 1, pp. 16-24, illus. 2).—Evidence is presented indicating that the resistance of certain strains of *S. aureus* is not induced by the action of penicillin on bacteria, but originates through mutation, and that penicillin acts as a selective agent to eliminate nonresistant individuals. The degree of resistance can be increased by exposures to higher concentrations of penicillin, and this increase is interpreted as due to a summation of the effects of several independent genetic factors for resistance which undergo consecutive mutation.

The spontaneous development of arsenic-resistance in *Trypanosoma equiperdum*, and its mechanism, H. EAGLE, H. J. MAGNUSON, ET AL. (*Jour. Pharmacol. and Expt. Ther.*, 82 (1944), No. 2, pp. 137-151, illus. 1).—There is reported the spontaneous development of a strain of *T. equiperdum* resistant to amino- and amide-substituted phenyl arsenoxides and their derivatives. The circumstances surrounding the development of this strain suggest that the change did not occur as the result of selection, but as a spontaneous variation. The organisms were 5 to 200 times more resistant to amino- and amide-substituted phenyl arsenoxides than was the parent strain, and the resistance was observed in vivo as well as in vitro. Their susceptibility to the unsubstituted phenyl arsenoxide, to derivatives with substituents which affect neither activity nor toxicity (e. g., —CH<sub>3</sub>, —Cl), and to acid-substituted phenyl arsenoxides, was, however, unchanged. The p-(CH<sub>3</sub>)<sub>2</sub>COOH phenyl arsenoxide, previously described as a compound with a favorable chemotherapeutic index in experimental trypanosomiasis, may be of particular therapeutic value because of its maintained activity against this and perhaps other strains resistant to amino- and amide-substituted compounds. Current theories as to the underlying mechanism of this selective arsenic-resistance are discussed.

Arsenical poisoning in stock, D. G. STEYN (*Farming in So. Africa*, 19 (1944), No. 223, pp. 649-652).—Experiments conducted at Onderstepoort are noted which indicated that grazing areas freshly sprayed against locusts with 0.6 percent sodium arsenite solutions at the rate of 110-120 gal. per acre is extremely dangerous to stock until heavy rains have fallen. Bait impregnated with sodium arsenite is considered much safer than spraying, but caution is given against broadcasting of excessive quantities. In tests of antidotes, treatment with ferric hydrate was found ineffective, while sodium thiosulfate ("hypo") proved to be the most valuable. The best results were obtained by administration both by mouth and intravenously.

Experience with lead poisoning in cattle, C. A. V. BARKER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 1, pp. 6-8).—Several cases resulting from the ingestion of lead in paint are described. "In our opinion the treatment of cases of lead poisoning should still be accompanied by a guarded prognosis until further studies have been made on detoxicants for lead."

Diagnosis of poisoning of beef calves by lead paint, C. L. SHREWSBURY, F. G. KING, E. BARRICK, J. A. HOEFER, and L. P. DOYLE. (Ind. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 20-23).—Beef calves in a corral with a fence which had been painted with lead paint about 3 yr. previously and was considerably weathered developed, after chewing the fence extensively, symptoms characterized by failure to nurse, refusal of feed, muscular tremors, partial and complete blindness, staggering, convulsions, and death. The most consistent findings on autopsy were nephrosis and abnormally high amounts of lead in the liver. These symptoms were reproduced in calves that had received known amounts of lead, while cows and calves from a local slaughterhouse had livers containing no lead and normal kidneys. Calves subsequently prevented from chewing the fence developed no symptoms of poisoning.

The relationship of oestrin to colonization of *Brucella abortus* in calves, C. A. MITCHELL and R. GWATKIN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 1, pp. 16-17).—Agglutination tests on two calves, each of which received injections in the mammary gland of 1 cc. of a saline suspension of agar culture of *B. abortus*, are tabulated. Little difference as to colonization was noted between the calf which had received 18 intramuscular injections of 1 cc. thelin and the control.

[Brucellosis control], A. W. MILLER. (U. S. D. A.). (*Jersey Bul.*, 64 (1945), Nos. 2, pp. 82-83, 123-124; 3, pp. 155-156, 158).—The first section of this article, entitled Three Methods of Brucellosis Control, is an abridgment of an address before the U. S. Livestock Sanitary Association and discusses the test-and-slaughter, test-and-slaughter with calfhood vaccination, and test-and-retention of reactors with calfhood vaccination methods. The second section, entitled Brucellosis in Dairy Cattle, deals with the effectiveness of adult vaccination, State regulations, and related factors and problems.

Cobalt treatment of a nutritional disease in New Hampshire dairy cattle: A preliminary report, H. A. KEENER, G. P. PERCIVAL, and K. S. MORROW (*New Hampshire Sta. Cir.* 68 (1944), pp. 8).—A disease which has been attacking cattle in Carroll County and vicinity for many years and is known locally as "Burton-ail" is described. This disease is characterized by one or more of the following symptoms: Depressed appetite, depraved appetite, constipation or diarrhea, rough hair coat, scaliness of skin, muscular incoordination, gauntness, loss of flesh, pale mucous membranes, decreased milk flow, retarded growth, and sometimes death. It has been most troublesome in young animals, but also existed in mature animals of both sexes. The more severe cases appeared in late winter and early spring, but improvement was usually observed when animals were turned on pasture. Observations in the lakes region of the county and elsewhere are reported. The symptoms were found to be similar to those reported for cobalt deficiency in Florida (E. S. R., 78, pp. 376, 836) and Michigan (E. S. R., 86, p. 91). The feeding of cobalt sulfate is recommended for treatment and as a preventive.

Studies on the hemorrhagic sweet clover disease.—XIII, Anticoagulant activity and structure in the 4-hydroxycoumarin group, R. S. OVERMAN, M. A. STAHL-MANN, C. F. HUEBNER, W. R. SULLIVAN, L. SEERO, D. G. DOHERTY, M. IKAWA, L. GRAF, S. ROSEMAN, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 153 (1944), No. 1, pp. 5-24).—Continuing this series (E. S. R., 90, p. 681), on the basis of the hypoprothrombinemia evoked by a single oral dose with standardized rabbits as the test animal, 3,3'-methylenebis(4-hydroxycoumarin) is rated the most potent anticoagulant of the 4-hydroxycoumarin class. The minimum structural requirements for activity are an intact 4-hydroxycoumarin residue, with the 3 position substituted by a carbon residue or a hydrogen atom. For high anticoagulant potency the bis-4-hydroxycoumarin molecule or a 4-hydroxycoumarin with the

3-substituent containing a keto group in the 1,5 position with respect to the 4-hydroxyl group is necessary.

Studies on the hemorrhagic sweet clover disease.—XIV, Hyperprothrombinemia induced by methylxanthines and its effect on the action of 3,3'-methylenebis (4-hydroxycoumarin), J. B. FIELD, E. G. LARSEN, L. SPERO, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 725-737, illus. 2).—Continuing the above series, it is shown that single oral doses of the methylxanthines, theophylline, theobromine, and caffeine, induce in the dog, rabbit, and rat a state of hyperprothrombinemia. This effect is not exhibited by other purines, pyrimidines, and related compounds. Choline and methionine are likewise devoid of this action. Single doses of the methylxanthines will protect a standardized dog against repeated doses of the anticoagulant 3,3'-methylenebis(4-hydroxycoumarin) for periods up to 14 weeks. Continued ingestion of caffeine and theobromine prolonged the survival time of rats fed the anticoagulant daily. It is suggested that the methylxanthines produce a functional stimulation of hepatic tissue, which accounts for the hyperprothrombinemia in normal animals and for the protective action against the anticoagulant. A possible bearing of these findings on the use of methylxanthines in conjunction with cardiovascular therapy is suggested.

Bovine mastitis and the microscopic examination of milk as a laboratory means of diagnosis, E. C. JESPERSEN (*North Amer. Vet.*, 26 (1945), No. 1, pp. 33-35).—The author recommends the direct microscopic method as the most practical and accurate routine laboratory procedure in examining milk for mastitis. He indicates that "general use is not being made of the information we have on the control of mastitis," and that an educational campaign is needed.

Mastitis and the practitioner, R. W. ROACH (*Vet. Rec.*, 57 (1945), Nos. 2, pp. 13-16; 3, pp. 25-29, illus. 1).—Part 1 of this paper deals with the differential diagnosis of mastitis; part 2, with its treatment and prevention. The author suggests that for the present "our energies in research should be directed to finding out the simplest and quickest way of diagnosing latent mastitis so that this type of control can be placed on a nation-wide basis."

A preliminary report on penicillin in the treatment of chronic streptococcal mastitis, C. S. BRYAN, R. E. HORWOOD, and C. F. HUFFMAN. (Mich. State Col.). (*Vet. Med.*, 40 (1945), No. 3, pp. 87-89).—In these studies, intravenous administration of penicillin to a total of 400,000 units proved ineffective in the treatment of chronic *Streptococcus agalactiae*, as well as prohibitive in cost. Udder infusions were only mildly irritating to mammary tissue, since only a slight reduction in production and the appearance of a few flakes were noted in the milk of cows so treated. In all 32 cows were treated, and all of these became free from the chronic streptococcal mastitis in three dosages or less. The individual quarters of 2 of these cows, receiving 1,000, 5,000, 10,000, and 20,000 units per quarter, recovered with one treatment. Of 6 cows whose udders were infused with 5,000 units of penicillin per quarter, 4 recovered as a result of one treatment; the remaining 2 needed two treatments. Of 16 cows treated by infusing 10,000 units of penicillin per quarter, 12 recovered with one treatment, 3 with two treatments, and 1 required three treatments. Eight infected cows received 12,500 units of penicillin per quarter; 6 recovered from one infusion, 1 after two infusions, and the third required three infusions.

The use of sulphathiazole per os, and of sulphanilamide E. O. S., sulphanilamide L. S. F., sulphanilamide emulsion, acriflavine emulsion, proflavine sulphate solution, Tyrothricin, and Novoxil, by udder infusion, in the treatment of clinical *Streptococcus agalactiae* mastitis, R. W. ROACH (*Vet. Rec.*, 56 (1944), No. 48, pp. 457-458).—The author states that although the number of treatments

carried out was small, the results indicate that "we are not yet in a position to promise more than a clinical response in the treatment of clinical *S. agalactiae* mastitis. This emphasizes that our outlook toward mastitis should be changed so that the prevention of the disease is more widely advocated."

Studies of sheep parasites.—IV, Survival of sheep nematodes on pasture during the fall months, P. A. HAWKINS, C. L. COLE, and E. E. KLINE. (Mich. Expt. Sta.). (*Jour. Parasitol.*, 30 (1944), No. 6, pp. 373-376).—Continuing this series (E. S. R., 92, p. 416), an experimental plot of alfalfa-bromegrass was pastured from May 22 to September 1 with a group of ewes and their lambs infected with nine genera of nematodes. Parasite-free lambs were subsequently placed on this pasture for 2 weeks, removed to a screened straw-bedded box stall for 3 weeks, killed, and the nematodes removed, counted, and identified.

*Haemonchus contortus* larvae were killed on the pasture in 2 mo. or less, as shown by the fact that by November 4 infection of lambs failed to take place, and no infection with this species was noted during December or January. *Oesophagostomum columbianum* was greatly reduced in number after 2 mo. and had disappeared in 3½ mo. *Chabertia ovina* larvae also had been destroyed on the pasture in 3½ mo. However, in 4½ mo. the infective larvae of *Ostertagia circumcincta*, *Trichostrongylus colubriformis*, *Nematodirus*, and *Trichuris ovis* were still alive and capable of infection. Whether the larvae of *Cooperia curticollis* were still alive after 4½ mo. could not be determined, although they were still present at 3½ mo.

"It appears that under the climatic conditions of Michigan the most important parasites economically, *H. contortus* and *O[esophagostomum] columbianum*, are not perpetuated by the pastures, but by the breeding flock."

Controlling internal parasites of sheep, D. W. BAKER and J. P. WILLMAN (*N. Y. State Col. Agr., Cornell Ext. Bul.* 407, rev. (1944), pp. 26, illus. 15).—This is a popular discussion of symptoms, predisposing conditions, methods of prevention, medicinal treatment, a parasite-control program for New York State, and directions for drenching and for post-mortem examinations to identify the various internal parasites of sheep.

Pregnancy disease of ewes: Causes, symptoms, treatment, and prevention, F. E. HULL (*Kentucky Sta. Cir.* 57 (1945), pp. 8).—According to this practical account, "pregnancy disease being a nutritional disease, the practical and economical method of prevention and treatment is to supply the needed nutritional elements as feed rather than through the use of drugs, chemicals, and expensive nutritional concentrates. There is no evidence that serums and vaccines are of value as a treatment for the prevention of this disease."

Some observations on swayback disease of lambs, G. D. SHEARER and E. I. McDougall (*Jour. Agr. Sci. [England]*, 34 (1944), No. 4, pp. 207-212, illus. 1).—A brief account is given of the work done at the University of Cambridge on swayback, and a comparison is made with a similar disease occurring in Australia and due to an uncomplicated Cu deficiency of soil and herbage. It is shown that swayback in England is not due to a Cu deficiency of either soil or herbage, but nevertheless the affected animals suffer from a Cu deficiency and respond to Cu medication.

Ewes with a low blood Cu in Derbyshire on being transferred to Cambridge rapidly attained a normal blood Cu. Analyses of grass from widely separated swayback-affected areas showed that in no case was the Cu content low. A short discussion is given of the possibility of lead being implicated in the causation of the disease, but it is concluded that lead plays only a secondary role. It is pointed out that there is much fluorspar in the affected area of Derbyshire.

See also a note by Innes (E. S. R., 91, p. 74).

**Hog cholera: Suggestions on prevention and difficulties of diagnosis,** W. W. DIMOCK (*Kentucky Sta. Cir.* 58 (1945), pp. 10).—This popular account discusses progress in methods of control and difficulties in diagnosis, and makes suggestions on the prevention of hog cholera.

**Recognition and treatment of atypical cases of swine erysipelas,** G. A. HAWTHORNE (*North Amer. Vet.*, 26 (1945), No. 1, pp. 24-32, illus. 7).—The author indicates some of the difficulties in diagnosis of some atypical cases and the treatment therefor. On infected farms the simultaneous use of serum and culture is recommended, but "no culture should be introduced on noninfected farms, since carriers will result from the simultaneous use of these products in some cases."

**Trichinosis,** S. E. GOULD (*Springfield, Ill.: Charles C. Thomas, 1945, pp. 356+, illus. 129*).—This volume is designed to bring the more important aspects of trichinosis to the attention of workers in medicine and public health and to producers of pork, and to assist in the detection and control of the disease. The successive chapters deal with the history, life cycle, morphology, epidemiology, trichinosis in animals, pathology, immunology, laboratory diagnostic methods, symptomatology, diagnosis, treatment, prognosis, and control measures. A chronological bibliography of about 650 titles is included.

**Helminths of Minnesota Canidae in relation to food habits, and a host list and key to the species reported from North America,** A. B. ERICKSON. (Minn. Expt. Sta. et al.). (*Amer. Midland Nat.*, 32 (1944), No. 2, pp. 358-372).—In this study 23 species of helminths were recovered from the 287 wolves, coyotes, and foxes examined. The adult tapeworms found, all of which require intermediate hosts for the immature stages, reflect to a degree the food habits of the Canidae and the availability of the various food species. These helminths are those which are most apt to be transferred to captive fur-bearing animals.

"Among this group are the tapeworms *T[aenia] pisiformis*, *M[ulticeps] serialis*, and *M. packii*, whose larval stages occur in hares and rabbits. Each year tons of rabbit carcasses are sold to fur farmers for fox and mink foods. Unless good cold storage facilities are available, the chances for introducing these parasites to ranch animals are excellent. Likewise, there is danger of infection from the tapeworms *T. hydatigena* and *T. krabbei*, which pass the larval stage in the muscles of cattle, deer, and other ruminants.

"*E[chinococcus] granulosus* occurs in wolves and moose in endemic areas such as northeastern Minnesota. Cattle, sheep, and horses pasturing in woodlands of such regions are in danger of picking up the eggs of *E. granulosus* which have been passed out with the feces of wolves. The hydatid, or larval stage, may occur in any of the above animals which are frequently used as fox food. Infected foxes would be a constant source of danger to man and other animals. Stomach worms of the genus *Physaloptera* are believed to require insects for their larval stages, and the lungworm *Crenosoma vulpis* is known to pass the larval stage in various beetles. Living in the vicinity of fur farms, wild animals infected by these parasites would be a source of danger to captive animals through the various insects which would have the opportunity to feed on eggs passed out with the feces of the infected Canidae, and thus become parasitized by the intermediate stages. Ranch animals eating these infected insects, either intentionally or accidentally, would become infected by the adult forms of the parasites."

A host list and keys to the species reported from North America and a list of 39 references are appended.

**Parasites of beavers, with a note on Paramphistomum castori Kofoid and Park, 1937, a synonym of Stichorchis subtriquetrus,** A. B. ERICKSON. (Minn. Expt. Sta. et al.). (*Amer. Midland Nat.*, 31 (1944), No. 3, pp. 625-630).—A review of the literature.

**Galactose-poisoning in chicks.** H. DAM (*Soc. Expt. Biol. and Med. Proc.*, 55 (1944), No. 1, pp. 57-59).—Chicks fed a diet containing 54.6 percent of galactose developed violent spasms within a few days and early death. A high content of galactose was noted in the blood during the spasms, but about normal glucose. Muscle glycogen was about normal, but liver glycogen nearly zero. In check lots of chicks fed 54.6 percent of sucrose the abnormalities were absent, and in another series of experiments 10 percent of galactose was added to the sucrose diet without rise of clinical symptoms or disturbance of growth. Feeding the 54.6 percent galactose diet to rats was followed by the appearance of cataracts, as in work by Mitchell (E. S. R., 74, p. 419), but the galactose feeding did not result in low-liver glycogen and the blood galactose was not as high as in the chicks.

**The salt tolerance of chickens.** E. H. PETERSON. (*Univ. Ill. Vet. Rec.*, 26 (1945), No. 1, pp. 37-38).—The author reviews earlier studies, notably those of Selye (E. S. R., 90, p. 105), and concludes that salt given in the drinking water is more toxic than salt incorporated in the feed since its elimination by an increased consumption of water is impossible. Salty water should not be given, but "abundant evidence has shown the chicken to be tolerant of even enormous intakes of salt" when given as a constituent of the feed.

**Six-day chick disease.** F. D. ASPLIN, N. DOBSON, R. F. GORDON, and J. D. BLAXLAND (*Vet. Rec.*, 56 (1944), No. 48, p. 466).—The authors comment on the paper of Temperton and Bythell (E. S. R., 92, p. 707) by stating that a similar disease was encountered before the present World War. Reduced vitality, perhaps accentuated by low brooder temperatures and alleviated by the supplementing of chick mashes by meal and grain, is indicated.

**Six-day chick disease.** W. P. BLOUNT (*Vet. Rec.*, 56 (1944), No. 50, pp. 493-494).—This author also comments on the paper of Temperton and Bythell, and suggests that "the symptomatology of six-day disease may be related to an amino acid deficiency due to rapid feathering, and not solely to a deficiency of metabolizable energy in all-mash chick-starter rations."

**Six-day chick disease.** R. H. COMMON, W. R. KERR, and H. G. LAMONT (*Vet. Rec.*, 57 (1945), No. 5, pp. 45-46).—A condition said to have been sporadically encountered from time to time since 1929 is described, the name being chosen because losses began about the sixth day and continued for approximately 6 days thereafter. The problem is thought to be essentially physiological rather than pathological or purely nutritional, and the recommendation made is the feeding of highly digestible food during the critical period.

**An appreciation of chick-embryo origin fowl pox vaccine.** C. S. GIBBS (*Northeast. Poultryman*, 41 (1944), No. 5, pp. 10-11, 32).—From a comparison of chick-origin and chick-embryo-origin vaccines, using lots of 40 chicks, it is concluded that while the causative agents of roup, diphtheria, and sore eyes may be transmitted by chicken-origin vaccines, "properly prepared fowl pox vaccines of chick-embryo origin are free of complications and produce uniform takes that have no effect upon the health of chickens. Fowl pox vaccine diluted in the proportions of 25 mg. of desiccated chick-embryo virus in 2 cc. of sterile diluent produces satisfactory results."

**Milk as a beverage increased tapeworm infestation in poultry.** L. F. PAYNE, A. E. SCHUMACHER, and L. D. BUSHNELL. (Kans. State Col.). (*Poultry Sci.*, 34 (1945), No. 1, pp. 93-94).—Leghorn pullets fed from November 1 to September 3 a diet consisting of whole yellow corn and wheat, green alfalfa hay, and crushed limestone, supplemented by liquid skim milk in a vessel exposed to flies, were found to be 91.1 percent infested with tapeworms as compared with 51.3 percent for a similar lot receiving no milk. The milk-fed lot also showed a higher degree of infestation. Roundworms and ceca worms, however, were present in 89.1 and 86

percent, respectively, of the birds receiving no milk, as compared with 55.8 and 64.7 percent. In spite of the worm infestation, the birds attained a final weight of 4.5 lb., an average egg production of 172.16 in 44 weeks, a percentage production of 55.89, a percentage hatchability of 86.73, and a percentage livability of 74. It is thought that the use of liquid milk as a beverage during the growing period and an infestation of tapeworms at an early age might have proved more harmful.

**Effect of an all plant ration on the resistance of an omnivorous animal to parasitism,** J. E. ACKERT, D. S. BRANSON, and D. J. AMEEL. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 47 (1944), No. 2, pp. 215-218).—Soybean meal tested as a protein supplement to an otherwise adequate cereal ration for chickens 2 mo. of age proved to be as effective as either meat scrap or meat scrap and powdered skim milk in producing resistance to *Ascaridia galli*. The inferiority of peanut meal as a supplement demonstrated in earlier tests (E. S. R., 69, p. 593) is attributed to its lower percentage of digestibility.

**Sulphamezathine in the drinking-water as a treatment for caecal coccidiosis in chickens,** C. HORTON-SMITH and E. L. TAYLOR (*Vet. Rec.*, 57 (1945), No. 4, pp. 35-36).—Continuing work reported earlier<sup>a</sup> and confirmed by Hawkins (E. S. R., 90, p. 531), the sulfamethazine treatment in induced epidemics was deferred until symptoms of coccidiosis had appeared in pens in which the sawdust litter had been sprayed with sporulated oocysts. After the first deaths, a saturated solution of sulfamethazine was supplied in place of the drinking water. In three experiments the rate of mortality among treated chicks was reduced by 50 to 73 percent of that among untreated controls. Further experiments demonstrated the development of a strong immunity to coccidiosis in chicks which had survived a previous epidemic as a result of sulfamethazine treatment.

## AGRICULTURAL ENGINEERING

**Agricultural engineering,** J. B. DAVIDSON. (Iowa State Col.). (*Agr. Engin.*, 25 (1944), No. 12, pp. 471-472, 478).—The author presents, with the avowed purpose "to enlist the interest and secure the moral support of a larger group of members of the Society for the Promotion of Engineering Education in a new branch of the engineering profession," a definition of agricultural engineering in terms of its three main divisions—power and machinery, farm structures, and soil and water conservation—and an outline of its attainments and objectives designed to bring out its importance as a field of engineering training.

**Accrediting of agricultural engineering curriculums,** R. A. SEATON. (Kans. State Col.). (*Agr. Engin.*, 25 (1944), No. 12, pp. 473-476, 478).—The author points out that the List of Accredited Undergraduate Curricula of the Engineers Council for Professional Development fully accredits 3 only out of 11 submitted in agricultural engineering, together with 1 agricultural engineering option contained in a mechanical engineering curriculum. The analysis of 3 curricula not accredited are here given as typical examples, with the disapproval of which the author is in agreement. He believes that "now, while enrollments are at a low ebb, all agricultural engineering curriculums, courses, departmental organizations and staffs, as well as all these same items in all other fields of education, should undergo careful analysis and thorough study. Such changes should be made as may be found necessary to accomplish most surely and efficiently the desired objectives. Service courses for agricultural students should undoubtedly continue to be given by the department of agricultural engineering. These courses should be planned and taught in close cooperation with the agricultural faculty and should be designed to be of the greatest value to the agricultural students they serve. Perhaps an option in mechanized agriculture should be offered in the agricultural curriculum and

<sup>a</sup> *Vet. Rec.*, 54 (1942), No. 50, p. 516; 55 (1943), No. 9, pp. 109-110.

administered under direction of the dean of agriculture. This should not be titled as a curriculum in agricultural engineering or an option in agricultural engineering. In addition, . . . there is real need, in a moderate number of institutions, for a truly professional curriculum in agricultural engineering of such character as to merit fully accreditation by E. C. P. D." In conclusion the author briefly outlines a curriculum which, he feels, is satisfactory and should be approved.

[Agricultural engineering investigations of the Bureau of Plant Industry, Soils, and Agricultural Engineering] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. Rpt.*, 1944, pp. 7-8; also in *U. S. Dept. Agr., Agr. Res. Admin. Rpt.*, 1944, pp. 197-198).—Among devices reported upon are the use of white paint on metal grain bins to delay spring temperature rises and the concomitant activation of dormant insect pests, a procedure resulting in keeping the temperature about 10° [F.] lower and insect propagation about 1 mo. later than in unpainted bins; determination of corncrib conditions and practices needed to avoid spoilage due to excess moisture content; successful compression of a western type of cotton to a density of 22 lb. per cubic foot instead of the 11-lb. density of previous practice, whereby it is possible to load 130 bales into freight cars formerly holding only 80 bales; and tracing of the so-called "air cuts" in compressed cotton to unequal packing in the bales caused by the action of the "dogs" used to hold the lint in place during pressing at the gin, together with the designing of plate-dog mechanism that eliminates cutting of the bale.

Federal-State cooperative snow surveys and irrigation water forecasts for Oregon. (Coop. Oreg. Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1945, Feb., pp. 14+, illus. 3; Mar., pp. 14+, illus. 3).—Forecasts as of February 1 and March 1 are given.

Federal-State cooperative snow surveys and irrigation water forecasts for Columbia Basin [as of January 1, February 1, and March 1, 1945]. (Coop. Montana Expt. Sta. et al.). (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1944, Jan., pp. 10+, illus. 2; Feb., pp. 16+, illus. 2; Mar., pp. 17+, illus. 2).—The 1945 water supply outlook as of January 1, February 1, and March 1 is set forth.

Yes, mine waters can be made fit to drink (*West Virginia Sta. Bul.* 317 (1944), p. 11).—Treatment of acid water from a sealed mine with quick or hydrated lime or combinations of either of these with limestone removed sulfuric acid and sulfates to yield water apparently satisfactory for livestock. The lime sludge remaining after this treatment was harmless as a top dressing for pasture land and, in some instances, appeared to have stimulated grass growth.

Development of agricultural land for irrigation, W. O. WALLINDER. (*U. S. D. A.*) (*Agr. Engin.*, 25 (1944), No. 12, pp. 467-470, 478, illus. 5).—The author notes that "the term 'agricultural land development' has been rather loosely applied to many phases of work incident to crop production," and defines such improvement as the modification of the land profile (through land leveling), shaping and planning the layout of farms and fields, and the construction and installation of farm irrigation and drainage ditches and control structures so as to insure maximum economy and efficiency in the application and use of irrigation water, all modification work being based on detailed soil, land-classification and topographic surveys, and future land use. He discusses here only valley bottom and valley bench lands. He describes the common characteristics of these two land types and notes some requirements of the soil land-classification and topographic map upon which the development must be based. In the examples named, maps drawn 200 ft. to the inch and for the preparation of the soils map the taking of from 6 to 12 samples in each 40-acre block proved satisfactory, contour lines being run at 1-ft. intervals. Where the natural surface slope is greater and where there is more uniformity in both topography and soils, the topographic map may be on a scale of 400 ft. to the inch. The remainder of the paper deals generally with the detailed planning of

development, the procedure being illustrated by maps showing natural and artificial drainage, soil, and land-type classifications, layout of planned farm units, etc., on a project bordering the Yellowstone River.

**Farm equipment in soil conservation,** T. B. CHAMBERS. (U. S. D. A.). (*Agr. Engin.*, 25 (1944), No. 12, pp. 484, 486).—The author feels that the question as to what the farm equipment industry can do to tie in with the soil conservation program most effectively can be partially answered by a brief review of the program and how it is being carried out, and here presents a review with emphasis especially upon the machinery needed and the potential market offered by the farmer who has not heretofore instituted conservation measures. General data summarizing the national extent of the conservation work of numerous types remaining to be done are added.

**The problem of securing machinery for farm reservoir construction,** J. L. MCKITTRICK. (Univ. Ky.). (*Agr. Engin.*, 25 (1944), No. 12, pp. 460, 462, illus. 1).—The author notes that an extended period of drought over much of Kentucky in 1943 and an increase in the number of livestock on farms have created a scarcity of water on farms throughout the State, for which there is apparently no remedy unless power equipment for reservoir construction can be made available to farmers through custom operators. Advantages and disadvantages of custom-operated and cooperative-association-owned pond-making machinery are compared. The conclusion is that a greater advantage probably rests with the privately owned and custom-operated equipment. In any event machines currently available for purchase under priority restrictions allow the State about as many track-type tractors as the author believes would be needed to meet the demand for pond construction in any one of a number of counties where the water shortage has been felt most acutely.

**Report of the Administrator of the Rural Electrification Administration, 1944,** H. SLATTERY (U. S. Dept. Agr., *Rural Electrif. Admin. Rpt.*, 1944, pp. 20).—The report covers such extension of farm electrical service as material shortages have permitted and other activities integrating more or less directly into the national war production program.

**Farm electrification—A challenge,** F. E. WATTS (*Agr. Engin.*, 25 (1944), No. 12, pp. 479-480, 482).—The author finds on the basis of economic data cited that "20 percent of people living on farms are Negroes and illiterate whites whose income is barely one of subsistence, and that many small farms are not really farms at all." He holds that electrification and increased use of productive electrical equipment and electrical farm conveniences constitute one of the important means for bringing up farm income to something better than a subsistence level.

**Electric lamps for farm lighting requirements,** L. C. PORTER (*Agr. Engin.*, 25 (1944), No. 11, pp. 427-428, 430).—An illuminating engineer connected with one of the large manufacturers of electrical equipment here describes the various types of lamp made for general lighting and for such special illumination as ultraviolet irradiation and air sterilization, heating by the penetrating radiant energy of infrared lamps, flood lighting with special reflector bulbs for night outdoor work, etc. The special methods necessary in the use of sterilizing and other ultraviolet lamps to avoid eye injury or excessive erythema are noted, and adaptations of these measures for the use of air-sterilizing ultraviolet lamps in poultry houses are suggested.

**Applications of new developments in timber construction to farm buildings,** L. P. KERTH (*Agr. Engin.*, 25 (1944), No. 12, pp. 461-462, illus. 2).—The author discusses the newer forms of wood and wood construction and their probable applications in agricultural construction from the viewpoint of the lumber manufacturer. Split-ring connectors and glued laminated-wood columns as supports permit such construction as that of 150-ft. wooden trusses. An example of connector-built arches having a span of 237 ft. and height of 153 ft. is also cited. A photograph of

a barn having laminated-wood arches and timber connectors at critical joints is reproduced. The insulation and construction use of composition boards made from wood fiber and sawmill wastes is noted. The author holds that lapped joints made with spikes and glue are likely to displace the long-practiced but poor toenailed joint. Wood impregnation and compression in a process implied to involve the use of plastics has yielded a material having 80 percent of the strength of steel with but 20 percent of its weight. A compressed impregnated paper product is also mentioned.

**Gypsum board in farm building construction**, H. J. SCHWEIM (*Agr. Engin.*, 25 (1944), No. 12, pp. 477-478, illus. 2).—The author points out the advantages of gypsum as a fire-proofing material, of which it is not necessary to use excessive bulk or weight to provide appreciable fire protection, and describes the various forms in which the material may be obtained. Although plain gypsum board when used for siding requires two coats of oil paint, gypsum siding already weather-proofed at the mill may also be purchased. It is recommended that in damp locations a heavy coat of asphalt paint be applied.

**Dairy barn construction** (*Vermont Sta. Bul.* 520 (1944), p. 18).—Relative insulation efficiency data for various materials tested over a period of 2 yr. in a barn for young stock showed that there was no outstanding difference in the insulating efficiency of rock wool, glass wool, and pine shavings installed in the side walls; and that in the ceiling, foil paper, single balsam mats, or chopped old hay were not as efficient as glass wool, rock wool, or pine shavings. Partial summation of data obtained in the main dairy barn gave similar results.

**Temporary-portable silos**, H. C. SMITH (*Agr. Engin.*, 25 (1944) No. 9, p. 336, illus. 1).—The author briefly discusses some favorable and unfavorable features of the paper-lined, fence-ring type of emergency silo, of which successive rings or sections are set up as the lower one is firmly packed with silage. He regards the first cost as too low to indicate either the real over-all cost or the real over-all values and conveniences that are purchased. The low cost, however, enables more farmers to try out silage in the first place then would otherwise be possible, since a beginner with silage (or with a new grass or other silage) may try it in a temporary silo with an investment of less than \$50. A further advantage is the flexibility of the method, as whether the temporary silo is used to supplement a larger permanent silo, or is the only silo, a farmer need buy and erect no more nor less silage capacity than he requires and with little regard for use in succeeding years. The advantages of portability and availability are also noted, although with both fence and paper lining in short supply, the last-named advantage is currently of limited effect.

**Factors influencing the design of bulk storage bins for rough rice**, H. A. KRAMER (La. Expt. Sta.). (*Agr. Engin.*, 25 (1944), No. 12, pp. 463-466, illus. 10). The author reports measurement of a number of such characteristics and physical constants of rough or "paddy" rice as determined its storage bin requirements.

Determinations of the carbon dioxide devolved in milligrams per 100 gm. per 24 hr. from such rice, when incubated at 37.8° C. at a moisture constant ranging from 10.37 to 16.11 percent for 4 days, led to the conclusion that rice to be held in bulk storage during a considerable period should not contain more than 14 percent moisture. The angle of repose of rice of 14-percent moisture content was determined (variation not usually more than  $\pm 1$  percent from the mean) at 34° for the common and at 36° for a long-grained variety, the corresponding coefficients of friction of the grain upon itself (tangents of the repose angles) being 0.675 and 0.727, respectively. The coefficient of friction of the two rices with respect to various bin materials ranged from 0.402 to 0.583, varying both with the material and with the grain variety. The long-grained rice had consistently the higher coefficient of friction against any one material. The ratio of lateral to vertical

pressures,  $k$ , for rice was determined with a model bin 2 ft. deep and 1 sq. ft. in cross-sectional area. Loadings were increased up to a maximum of 868 lb., the practical limit with the equipment used. The ratio,  $k$ , increased very rapidly at low pressures, but soon reached a level constant for the remainder of the range of pressures applied. Only about 27 percent of the total vertical load was transmitted through the 2-ft. column of rice to the bottom gauge.

On the basis of these findings and related considerations the author discusses general requirements of rough rice storage bins, ventilation, bin size and conformation, fire protection, handling and conveying equipment, and strength requirements of rough rice storage bins.

**Developments in mechanization in 1944.** P. W. GULL, T. L. BAGGETTE, and J. E. ADAMS (*Miss. Farm Res. [Mississippi Sta.] 8* (1945), No. 1, pp. 1-2).—Flame cultivator experiments on cotton similar to those carried out by the Louisiana Station on sugarcane (E. S. R., 92, p. 277) are discussed. A flame chopper seemed to have some advantage when young cotton was chopped, because of somewhat better control of small grass and weed plants. For the full range of height at which cotton plants can be thinned to a stand, a single-row mechanical chopper showed advantages.

**The self-propelled combine.** J. TUCKER (*Agr. Engin.*, 25 (1944), No. 9, pp. 333-336, 348, illus. 3).—This machine has the advantage, in the author's view, that it is operated by one man better and faster than two men operate a tractor-pulled machine. The self-propelled machine is in many ways more maneuverable and its driver can stop it immediately when plugging is observed and before the machine is plugged tight. Elimination of the use of a tractor saves manpower, fuel, and repair parts while the tractor is released for other work. The self-propelled combine saves time in opening fields and in preparing to move in or out and avoids the practical destruction by the tractor-drawn machine of an 8-ft. swath in opening a field. A self-propelled 7-ft. machine running 5 m.p.h. will do as much or more work as will a 12-ft. tractor-drawn machine and will cost no more. It will cost but little more than a 6-ft. machine with an auxiliary engine.

A discussion by S. D. Pool agrees in general with the author's statement of the points of superiority of the self-propelled machine. An additional point brought out in this discussion is the advantage of having the tractor free for plowing and summer fallowing, which when done at the same time as harvesting conserves the moisture available for subsequent crops.

**A sheller for seed peanuts.** O. A. BROWN and I. F. REED. (U. S. D. A.). (*Agr. Engin.*, 25 (1944), No. 11, pp. 424, 426, illus. 2).—The authors point out that the high cost (\$500 or more) and large power requirements (5 h. p. or greater) of most of the shellers now on the market limit such units to use by custom operators or farmers with a large acreage in peanuts. The small seed peanut sheller here shown in sectional view and a photograph was developed to meet the needs of the farmer with about 30 or more acres or groups of farmers with smaller acreages.

It is 36 in. high, exclusive of hopper. The cylinder is 13 in. wide. It is so arranged that one V belt from a 1-h.p. electric motor or a 1½-h.p. engine to the rotating shafts drives the entire unit. The sheller without power unit weighs only 165 lb. and will turn out about 300 lb. of shelled peanuts per hour (about what one man can do by hand in 30 days of 10 hr. each). The shelling unit proper consists of a rubber-covered cylinder and a perforated concave. The spacing between the cylinder and the concave is approximately 1½ in. The concave may be adjusted to give the best shelling. The shelling cylinder is driven at approximately 500 r. p. m. This speed, higher than that used on most peanut shellers, together with the rubber cover on the cylinder, gives the machine its large capacity. The unshelled peanuts are rubbed against each other by the shelling cylinder until the shells are

broken. The shelled peanuts and broken shells then pass through the perforated screen into a very simple air separator. The two boards which form either aspirator make an angle of 90° with each other under the concave. The fan, 5 in. wide and 12 in. in diameter, has an intake from the aspirators on either side of the discharge spout. The separator unit consists of two screens mounted one above the other in a framework vibrated by arms connected to eccentrics on the cylinder shaft. Adjusting the lengths of these arms changes the arc of the screen vibration and controls the rate at which the material moves over the screen. The holes in the top screen are  $2\frac{3}{4}$  in. in diameter, those in the bottom screen  $1\frac{1}{4}$  by  $1\frac{1}{4}$  in. The unshelled peanuts flow over the top of the upper screen and are discharged to be put through the sheller again. The shelled peanuts pass through the top screen but are retained on the lower screen and are discharged through a spout. Cracked peanuts and other small material pass through both screens and may be collected under the sheller. A recleaner feed is provided to enable recleaning the shelled or cracked peanuts by feeding them through the cleaning units without putting them through the cylinder.

The germination of Spanish peanuts shelled with this sheller was equal to that for hand-shelled seed but 1 year's results indicated that the germination of runner peanut seed is lowered. In spite of the lower germination for the runner seed, the sheller was shown to be more economical than getting the seed hand shelled, however.

**Barn curing of hay with heated air.** J. STRAIT (Minn. Expt. Sta.). (*Agr. Engin.*, 25 (1944), No. 11, pp. 421-423, illus. 4).—A conventional duct system serving a mow 24 by 36 ft., placed in one end of a basement-type barn, was constructed in 1940 and has been operated under test during four haying seasons. The fan was placed in a lean-to shed at the end of the barn.

During the first two seasons, unheated air was circulated and two cuttings of alfalfa hay were processed each year. When the drying period was extended by unfavorable drying weather, the hay at the surface exhibited a moldy condition and the quality was generally poor in the upper layer, although improving from top to bottom with excellent quality hay always produced in the lower portion of the mow.

In the heated-air installation, an oil-fired furnace was placed between the fan and the main air duct. The fan circulated approximately 13,000 cu. ft. of air per minute. The furnace was designed to produce an increase in temperature of about 20° F. in the air delivered by the fan. It was of brick and concrete and unlined. The heat exchange unit consisted of 23 hot-air flues each made from two 24-in. lengths of 26-gauge smoke pipe 7 in. in diameter. The outlet ends of the pipes were cast directly into concrete slab headers 3 in. in thickness. The inlet ends of the pipes project into a  $7\frac{1}{2}$ -in. diameter hole in the concrete headers and the circumferential space is packed with asbestos cement. A commercial oil burner capable of burning up to 15 gal. of fuel per hour consumed approximately  $3\frac{1}{2}$  g.p.h. in this installation. There were two controls in the burner circuit, the primary control in the stack and a hot-air control projecting into the hot-air duct to serve as a safety device which would shut off the burner if the fan should stop.

The thermal efficiency of the furnace varied up to 78 percent, depending upon the temperature of the outside air. The flues remained in very good condition, and apparently could be depended upon to last through several seasons of operation. The concrete headers developed slight cracks at the sections of minimum thickness, but there would be no serious objections to this slight cracking after the headers were in place.

A temperature of 1,150° found in the furnace wall 10 in. above the top of the combustion chamber showed a need for a refractory lining to reduce serious heat

loss. Other temperatures and the general performance of the furnace were satisfactory, however.

The hay produced by the heated air was of superior quality in every respect. The entire mow was free from mold, and the hay was leafy and very green in color. The carotene loss was found to be 18.5 percent of the original content in two samples, a loss held to be considerably less than could be expected under the conditions of field curing.

**A firesafe, labor-saving livestock compound,** E. L. HANSEN (*Agr. Engin.*, 25 (1944), No. 11, pp. 417-418, illus. 2).—The design here shown in an architectural drawing and plan comprises quarters for 10 cows, 10 sows, and 100 hens, together with two pens and a milk room under the main roof; a feed room is joined to the main structure at the back. Three grain storages and one hay storage (all of circular plan) and a silo all open into the feed room. A hog-feeding floor and poultry sun porch are joined also to the main building, and the structure opens upon a paved, walled cattle yard. The building proper is shown as 78 by 34 ft. The use of concrete and concrete masonry both makes possible a degree of cleanliness which justifies from the sanitation viewpoint the uniting of hog house, poultry house, milk house, and dairy barn into a single plant and provides the complete fire safety especially essential in such a concentration of the plant investment. By this concentration there is attained an economy in materials and in exposure to external heat loss amounting to 60 percent less outside wall area, 37 percent less total wall area, and 50 percent less material in footings and foundations. The exterior wall surface being reduced by 1,737 sq. ft. in the combination of the buildings here united, the heat saving would amount, on the assumption of a U coefficient of 0.25, to 26,055 B.t.u. per hour when an inside temperature of 50° F. is maintained against -10° outside. The design calls for electric lighting and forced ventilation but no windows.

**Wood fuel burners,** G. BAKER (*Maine Sta. Bul.* 426 (1944), p. 392).—The author reports briefly upon experiments having the objective of increasing efficiency of combustion and conservation of fuel, uniformity of heat, and increased convenience through more widely spaced stoking periods. One unit, based upon one of the designs resulting from this work, has been built and was found to give satisfactory results throughout a winter.

**Fire fighting methods and equipment for rural communities,** H. G. INGERSON (*Agr. Engin.*, 25 (1944), No. 12, pp. 457-458, 466, illus. 4).—The author discusses a method of fire extinction consisting essentially in discharging the water from a fine-dispersion nozzle at a nozzle pressure of 600 lb. per square inch. The evaporation of the very fine droplets of the fog into an air-excluding steam blanket is said to occur almost instantaneously, with concomitantly swift cooling of the burning material below its ignition point. A striking experimental demonstration with such equipment is described, and the opportunity of the agricultural college engineering staffs to help in organizing and training personnel for rural community self-protection against fire is discussed in some detail.

**The Kent County system of rural fire protection,** R. MACHIELE (*Agr. Engin.*, 25 (1944), No. 12, p. 459).—The assistant county agricultural agent of this Michigan county reports on the use of the high-pressure fog fire-fighting equipment for a period of 19 mo., stating that "we feel it is the only type available that is well designed to fight rural fires." The principal reasons for this conclusion are that the high-pressure fog apparatus is more effective than ordinary capacity type equipment; that it uses water more efficiently, which is of great importance in rural fire fighting; and that it causes very little water damage. The organization of fire-fighting units consisting largely of volunteers is also reported upon.

## AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Maine Station] (*Maine Sta. Bul.* 426 (1944), pp. 259-262, 325-326, 363-368; 377-381).—Findings are briefly summarized for the following studies not previously noted: Effects of wartime conditions on the production of potatoes (pp. 259-262), based on data as to acreages of potatoes, livestock, labor, and machinery from 197 Aroostook County and 44 central Maine farms; storage, transportation, and selling Maine apples under wartime conditions (pp. 325-326); use of labor on Maine farms with dairy cows (pp. 363-365), problem in obtaining and feeding grain to dairy cows (pp. 365-366), trend in the volume of fluid milk sold by Maine producers (pp. 366-367), decrease in number of milk distributors (p. 367), and reorganization of milk collection routes in Maine (p. 368); and equipment needs and use of equipment and buildings on Maine poultry farms (pp. 377-378), grain problems and feed conservation practices of Maine producers (pp. 378-380), and farm labor on Maine poultry farms (pp. 380-381).

Agriculture in transition from war to peace (*West. Farm Econ. Assoc. Proc.*, 17 (1944), pp. 283+, illus. 14).—Included are the following papers, with discussions thereon, presented at the seventeenth annual conference of the Western Farm-Economics Association held at Los Gatos, Calif., June 27-29, 1944: The International Institute of Agriculture—An Experiment in International Cooperation, by L. L. Saqui (pp. 1-5); The Outlook for the Western States—Population Trends and Outlook for the West, by V. B. Stanbery (pp. 6-18), and The Economic Future of the West, by L. Lantz (pp. 19-29); The Outlook for Europe's Agriculture—The Prospects of European Agriculture and Their Implications for the United States, by K. Brandt (pp. 30-38); The Transitional Demand for Food, Feed, and Fibers—Shifts in Consumption of Specific Foods, by H. H. Sack (pp. 39-47), and The Demand for Agricultural Commodities in the Period of Transition From War to Peace, by J. B. Canning (pp. 48-64) (U. S. D. A.); The Settlement of War Veterans and Other New Farmers—Settlement on the Land After the War, by F. Adams (pp. 65-76) (Univ. Calif.); The Transitional Economic Position of the American Farmer—Agricultural Prices Following World War II, by O. V. Wells (pp. 77-92), Post-war Irrigation Developments and the National and Regional Agricultural Economy, by M. Clawson (pp. 93-109), Wartime and Post-war Farm Labor in the West, by G. W. Hill (pp. 110-125), and Notes on the Use of Farm Plans and Farm Budgets in Over-all Planning for Irrigation Reclamation Projects, by W. U. Fuhriman (pp. 126-133) (all U. S. D. A.); Possibilities of Providing More Opportunities for Agriculture Through Farm Reorganization, Changes in Intensity, and Adoption of Improved Practices, by P. A. Eke (pp. 134-138) (Univ. Idaho); Use of Enterprise Efficiency Data in Planning Adjustments in Farm Organization and Production, by L. W. Fluharty (pp. 139-143) (Univ. Calif.); Postwar Disposition of Government Food Stocks, by F. V. Waugh (pp. 145-150) (U. S. D. A.); Adjustments in Western Beef Cattle Production and Marketing During the War and Post-war Periods, by M. H. Saunderson (pp. 151-155) (Mont. State Col.); Possible Influence of Technological Developments on Post-war Dehydration and Freezing of Foods, by T. L. Swenson (pp. 156-164), and Trends in the Farm Real Estate Market, by H. E. Selby (pp. 166-172) (both U. S. D. A.); Establishing Real Estate Values for Lending Purposes, by H. McClelland (pp. 173-177); Determination of "Normal" Agricultural Value of Farm Land and Sound Credit Policies, by C. Wright (pp. 178-184); The Relation of Public to Private Lending Agencies (in Agriculture) and Recent Trends in Their Development, by M. R. Benedict (pp. 185-198) (Univ. Calif.); Repayment Experience on Federal Reclamation Projects, by A. Joss (pp. 200-215), Large Farms or Small—The Social Side, by W. R. Goldschmidt (pp. 216-227), Do We Need Any New

Farms, by A. Shultz (pp. 228-230), Socio-economic Aspects of Feeding War Workers, by W. E. Broeg (pp. 232-234), and Efforts to Improve the Nutritional Status of the Public, by M. L. Wilson (pp. 235-239) (all U. S. D. A.); Food as a Factor in Public Morale and Military Strength, by A. W. Stanley (pp. 240-245); Western Farm Economics Association, by G. Baker (pp. 246-249); Racial and National Elements in the Population of California, by D. McEntire (pp. 254-258); The Japanese Minority in Colorado Following Evacuation, by R. W. Roskelley (pp. 259-265) (Colo. State Col.); Resistances to Resettlement, by M. Opler (pp. 266-270); and Synopsis and Critical Review of the Conference, by J. B. Canning (pp. 272-274) (U. S. D. A.).

**Foreign Agriculture [February-March 1945]** (*U. S. Dept. Agr., Foreign Agr.*, 9 (1945), Nos. 2, pp. 17-32; 3, pp. 33-48, illus. 1).—No. 2 includes an article, United Kingdom Agricultural Production and Price-Support Policy, by M. Ogdon (pp. 18-30), discussing the origin of the price-support measures, subsidy and marketing schemes, wartime developments, and the direction of postwar policy; and an article, The People's Granaries of Liberated Italy, by V. B. Sullam (pp. 30-32), discussing the achievements and future prospects.

No. 3 includes an article, Wartime Food Situation in the Middle East, by A. I. Tannous (pp. 34-45), describing the prewar situation, the development of wartime problems, the measures adopted to relieve the food situation, and the achievement and outlook; and an article, On Flooding in the Netherlands, by L. E. Butt (pp. 46-48).

**Planning the farm for profit and stability**, N. W. JOHNSON (*U. S. Dept. Agr., Farmers' Bul. 1965* (1945), pp. 30+, illus. 11).—The importance of planning land labor resources and the capital needed, the choice and combination of enterprises, and planning for the farm as a whole are discussed and information given as to the aids to planning available.

**Farming opportunities in Idaho**, P. A. EXE and K. HOBSON (*Idaho Sta. Bul. 258* (1944), pp. 32, illus. 17).—This bulletin, for persons desiring to locate on farms in the State, takes up the types of farms in different areas, the requirements for success in farming, how to locate a farm, whether to purchase or rent, how much and how to pay for a farm, etc.

**Farming in Cumberland County in the claypan region of southern Illinois: A study of the effect of differences in soil and topography**, R. C. Ross, V. B. FIELDER, and G. H. WALTER. (*Coop. U. S. D. A.*) (*Illinois Sta. Bul. 506* (1944), pp. 273-320, illus. 16).—This study of the effect of differences in soil and topography was made in an area characterized by small farms, low farm incomes, and soils of low productivity. Farm survey records were obtained for about 55 families selected at random in each of the five areas—hilly, light-gray prairie, dark-gray prairie, river bottom, and morainal soils. These were supplemented by special field surveys on pastures, soil erosion, and woodlands, and data from county records on public assistance, assessed value of lands and improvements, and from the Old Age Assistance Administration, Works Progress Administration, and the Illinois Emergency Relief Commission. The clay pan region, Cumberland County, the population, agricultural trends, the soil areas and the farming in each, the level of living, and the recent shifts in production are discussed and recommendations made as to farming practices, use of lime, cropping systems, pasture and woodland improvement, size of farms, livestock adjustments, and living conditions.

**Economic land classification in King and Snohomish Counties, Washington, and its influence on full-time farm returns**, A. W. PETERSON, M. T. BUCHANAN, and B. D. PARRISH (*Washington Sta. A. E. 5* (1944), rev., pp. 29+, illus. 1).—Economic land classification, the method of preparing economic land class maps, and the delineating areas are described. Analyses are made of the income, level of living, and other differences between the economic land use classes in the two

counties and the factors affecting full-time farm returns within the economic land classes.

Production on land classes better than class 3 is sufficient to provide a good level of living for full-time farming. Where the major part of the income is from the land in classes 4 and 5, society must pay part of the costs of roads, education, electricity, credit, etc., and in depressions, parts of the family living expenses. Land use class is closely associated to level of living, cultural possessions, social participation in community activities, leadership, etc. Size of farm business, either in physical units of production or in dollars, decreases in importance from class 1 to class 5. The son of a farmer on class 1 or 2 land must have a very good job to justify not returning to the home farm. On classes 4 and 5 industry or movement to better land use classes is almost always better than remaining in the same neighborhood. Increased size of business is associated with increased returns in the better land classes and with no increase or a decrease in the poorer classes. Farmers on land classes 1 and 2 can afford the best practical equipment available, while those on classes 4 and 5 find it practical to use second-hand equipment. Only farmers on class 1 and 2 lands can afford to experiment with new enterprises or methods. It is better to be a hired man on land classes 1 and 2 than an owner-operator on class 5. Tenants on classes 1 and 2 ordinarily have a higher level of living than most owner-operators on land classes 3, 4, and 5. The social cost of keeping land class 5 occupied under present use is great. The highest rating of children for such characteristics as independence, resourcefulness, family morale, etc., is on land classes 1 and 2 and lowest on classes 4 and 5.

The farm real estate situation, 1943-44, M. M. REGAN, A. R. JOHNSON, and F. A. CLARENBACH (*U. S. Dept. Agr. Cir. 721 (1945)*, pp. 45+, illus. 10).—This is a continuation of the series (E. S. R., 90, p. 536) and includes a bibliography.

The indexes of farm real estate values (1912-14=100) in the different geographic divisions and the United States as a whole and the percentages of increase over 1943 were: United States 114, 15 percent; New England 122, 9; Middle Atlantic 109, 6; East North Central 110, 15; West North Central 88, 16; South Atlantic 145, 14; East South Central 159, 13; West South Central 125, 12; Mountain 107, 16; and Pacific 150, and 19 percent. By November 1, 1944 a further increase of 5 percent for the United States had occurred, reaching a level of more than three-fifths above the 1933 low, more than two-fifths above the 1935-39 average, and less than one-third below the 1920 inflation peak. The volume of voluntary sales was the highest on record. It is estimated that more than 10 percent of the sales were resales of lands acquired within 2 yr., ranging from 7 percent in the northern Great Plains to 16 percent in the Pacific area. In the year ended March 1944 farmers bought about two-thirds of the farms. Approximately 50 percent of the recorded sales in 1943 and the first half of 1944 were for cash, and the down payments on the remainder averaged about two-fifths of the purchase price. Mortgages used in financing the purchases amounted to 75 percent or more of the prices for one-third and 50 percent or more for three-fourths of the sales financed through credit. The estimated total farm-mortgage indebtedness decreased 7.9 percent during the calendar year 1943 and was the lowest since 1916 and but little over 50 percent of the peak reached in 1923. Prices received by farmers and cash farm incomes were only slightly above the previous year, but the prices were over 80 percent above 1935-39. Estimated agricultural production in 1944 was expected to be slightly above 1943 and 2½ times that of 5 yr. ago. Current rates of returns on farm land were at record levels and materially above those on most alternative investments. Farm real estate taxes have moved within a very narrow margin during the last decade and are at about 80 percent of the levels before World War I and two-thirds of the peak in the late 1920's. Prices paid by farmers for commodities increased more rapidly during the year than prices received, but operating costs continued to lag

behind income increases. Shortages of farm labor, machinery, equipment, and fertilizer, and transportation difficulties were serious deterrents to land value increases.

**Agricultural Finance Review [November 1944] (U. S. Dept. Agr., Bur. Agr. Econ., Agr. Finance Rev., 7 (1944), pp. 109+, illus. 9).**—Included are the following articles: Insurance and the Farm-Risk Problem, by V. N. Valgren (pp. 1-8); Agricultural Credit Aids—A Suggested Approach to an Appraisal of Costs and Benefits, by D. C. Horton (pp. 9-18); Small-Policy Life Insurance for Farmers, by R. R. Botts (pp. 19-30), discussing small-policy life insurance including insurance for funeral goods and services; Federal Fiscal Measures and Agricultural Prosperity, by T. F. Haygood (pp. 31-38), discussing the influence of depression and war upon fiscal policies, Federal taxation, borrowing, and expenditures and rural prosperity, and the conflicting philosophies in use of fiscal policies to promote prosperity. Several short statements and statistical tables are included on mortgage debt and interest rates, production credit association loans, rural rehabilitation loans, emergency crop and feed loans, rural electrification developments, non-real estate loans to farmers, farm real estate taxes, etc.

**An economic study of orchard tree removal, F. L. OVERLEY, E. L. OVERHOLSER, and G. SISLER (Washington Sta. Bul. 443 (1944), pp. 26).**—Based on an experiment in which the trees in half a block in a 35-year-old Winesap orchard were removed in 1940, reducing the trees per acre to 27, analysis is made for the block as to the production, operation requirements, cost of labor, materials, and use of equipment, prices received per box of apples, gross and net returns, etc., each year, 1940-43 inclusive, compared with an unthinned block.

The wide-spaced block produced 61, 72, 77, and 100 3 percent of the yields of the closely spaced block in the respective years. The costs per acre for the wide-spaced trees of labor, use of equipment, and materials at 1940 prices were approximately \$146, \$137, \$110, and \$31 less in the respective years. The net profits per acre based on 1940 prices from widely spaced trees were \$35.27 less in 1940, \$38.93 less in 1941, \$17.14 greater in 1942, and \$97.69 greater in 1943 than those from the closely spaced block. Other advantages of the wider spacing were reduction of labor requirements, increased production of high grade fruit, increased size of fruit, less injury due to excessive pruning, improvement of cover crops, and easier control of insects and diseases.

**Farm labor on Maine poultry farms, A. L. PERRY (Maine Sta. Misc. Pub. 597 (1944), pp. 16+, illus. 5).**—This bulletin, based on the same survey as Miscellaneous Publication 589 below, discusses the total and seasonal labor requirements, the sources of the labor, the importance of different types of labor, wages, turn-over, and the effects of the labor shortage on production.

The operators and families did 83 percent of the work, but 55 percent of the farms employed hired labor during the year. On an average 16.7 months' man labor per farm was used during the year ended August 31, 1943, 45 percent of the farms using less than 13 months' and 7 more than 36 months' man labor. Of the poultrymen with less than 300 layers, 38 percent had full time off-the-farm employment. The family labor varied little during the year, but the regularly hired labor was about 42 percent greater in May-August, inclusive, and day labor used was six times as great in July and August as in other months.

**Grain problems and feed conservation practices of Maine poultry producers, A. L. PERRY (Maine Sta. Misc. Pub. 589 (1944), pp. 22+).**—Data were gathered in October 1943 regarding methods of obtaining grain, labor, and equipment on 262 poultry farms in three areas of the State. Of the farms, 241 kept laying hens, 7 were broiler producers, and 16 had started raising poultry during 1943. The effects of the grain shortage on early sale of layers and chickens, the number of broilers, baby

chicks, and eggs produced, and the demand for and hatchability of hatching eggs are described and the feeding practices discussed.

**Equipment needs and use of poultry equipment and buildings on Maine poultry farms, A. L. PERRY (*Maine Sta. Misc. Pub. 591* (1944), pp. 27+).**—On the basis of data from the survey noted above, the equipment and buildings existing, the needs for additions, and the use of general farm equipment for the poultry enterprise are discussed. In general, the poultrymen interviewed were not greatly handicapped by inadequate poultry equipment and were not making maximum use of housing facilities.

**Storage facilities for the 1943 Maine potato crop, C. H. MERCHANT.** (Coop. U. S. D. A. et al.). (*Maine Sta. Misc. Pub. 577* (1943), pp. 10+, illus. 3).—Tables from railroads, the State and Aroostook County War Boards, and potato growers and shippers show by areas of the State the estimated potato production for 1943 and the estimated farm and track storage available and proposed new storage.

With a probable crop of 62.4 million bushels, frost-proof storage for 12 to 13 million bushels would not be available and the facilities in six and possibly all of seven producing areas were deemed insufficient.

**Machinery requirements on Aroostook County farms, 1943, W. E. SCHRUMPF (*Maine Sta. Misc. Pub. 588* (1944), pp. 12+).**—On the basis of data from 197 farms, the proportion of farms with various kinds of machines, the distribution and age of machines in relation to potato acreage, the variation in age, expected additional years of use, and estimated amounts of replacements and repairs are discussed.

**Transportation of livestock by motor truck to the Kansas City market, H. M. HAAG, F. L. PARSONS, C. P. WILSON, and J. H. McCOV.** (Coop. Mo. Expt. Sta.). (*Kansas Sta. Bul. 324* (1945), pp. 59).—The data were gathered by personal interviews with truckers of 518 truckloads of livestock May 3-6, 1942, and 455 loads, December 19-22, 1943. The surveys covered about 1,600 tons of livestock in 1942 and 1,800 tons in 1943. The sample included about 20 percent of the truckers unloading during each period. Analyses were made of the truck facilities—type, age, and condition of trucks; the type of bed; mileage; normal gross, net, and physical capacities; number of trips made; number and weight of animals per load; insurance carried; consignees per load; and the relation of the different factors—volume, type of commodities handled, etc., of return loads. The relations of gross, net, and physical capacities; difficulties in livestock trucking during the war; and the suggestions of truckers are discussed and recommendations made for increasing livestock trucking efficiency.

The average age of the trucks in the 1943 study was 3.2 yr., that of trucks operated by farmers handling their own stock being about twice of those used by non-farm operators operated for hire. About 90 percent of the trucks were in fair to excellent condition. About 50 percent had been driven over 100,000 miles. Ten to 20 miles of travel were required to assemble a load. The weighted average distance to market was about 100 miles. The loads hauled averaged 88 and 93 percent of the net capacity and 78 and 88 percent of the physical capacity, respectively, in the two surveys. To deliver 1,000 lb. of livestock in 1943 required 10 miles of travel with semi-trailers, 12.5 with standard trucks, and 29 miles in pick-ups. About 52 percent of the truckers in 1942 and 46 percent in 1943 had hauled return loads on the preceding trip, averaging 42 and 50 percent of the net capacities of the trucks. On both parts of the round trip 65 percent of the net capacity was used in 1942 and 72 percent, in 1943. Forty percent of the truckers had difficulty in obtaining repairs in the fall of 1943. Shortage of drivers, mechanics, and tires; inadequate gasoline supplies; worn-out trucks; loading and unloading; poor roads; and death of livestock were other difficulties. Lack of planning or coordinated

direction in the assembling of livestock in many instances resulted in route duplication, gross hauling, and underloading.

**Survey of Scranton farmers' night market,** W. R. WHITACRE (*Pennsylvania Sta. Jour. Ser. Paper 1275 (1945)*, pp. 9+).—The study was made to determine the feasibility of a permanent all-year market of the retail type which had operated in a temporary location three nights per week during August-November, inclusive, 1943.

**Application of the Federal income tax statutes to farmers' cooperatives,** G. J. WAAS and D. G. WHITE (*U. S. Dept. Agr., Farm Credit Admin. Bul. 53 (1942)*, pp. 191+).—The bulletin, which supplements Miscellaneous Report 63 (E. S. R., 90, p. 544), is intended for reference use of officers and managers of farmers' cooperative organizations, their attorneys and advisers, and public accountants. It also contains general information on some of the operating philosophies and procedures that mark the cooperative way of doing business. The tax legislation, value of exemptions, and the general rules for securing and maintaining a tax-exempt status are described and analysis made of the statutes, interpretations, rulings, regulations, etc., on the 10 major conditions applying to tax exemption requirements. It discusses the general position, legal or corporate requirements, refund payments, and computation and accounting requirements of nonexempt farmers' cooperatives. Included are copies of forms and selected exemption sections of the Internal Revenue Code of 1941 and of Income Tax Regulations 103 of 1941.

**Agricultural statistics, 1944,** J. A. BECKER ET AL (*U. S. Dept. Agr., 1944*, pp. 587+).—This annual volume (E. S. R., 91, p. 88), prepared under the direction of the Yearbook Statistical Committee, brings together in condensed form the more important series of statistics prepared or compiled by the Department on grains, cotton, sugar, tobacco, oilseeds, fats, oils, fruits, vegetables, melons, nuts, hay, seeds, minor field crops, different kinds of livestock, dairy and poultry products, farm capital and income, agricultural conservation and adjustment, and miscellaneous subjects—Weather Bureau reports, naval stores, fisheries and fish, food distribution and relief programs, Government purchases, freight tonnage and revenue, Extension Service workers and accomplishments, and refrigeration.

**Annual report on tobacco statistics, 1944** (*U. S. Dept. Agr., War Food Admin., Off. Distrib., 1944, CS-12*, pp. 95+, illus. 1).—The ninth report of the series (E. S. R., 91, p. 88).

**Commodity futures statistics, July 1943-June 1944** (*U. S. Dept. Agr., War Food Admin., Off. Distrib., 1944, CS-11*, pp. 31+).—A continuation of the series (E. S. R., 91, p. 207).

## RURAL SOCIOLOGY

**Social problems** (*North Carolina Sta. Rpt. 1943*, pp. 103-107, illus. 1).—In 1920, the United States Census found 206,344 youth 10-14 yr. of age living on the farms of North Carolina, but 20 yr. later there were only 95,227 people 30-34 yr. of age. Death took 22,417, but 88,700 youth (net) must have migrated to cities or to other States. It is concluded that since at least half of the farm youth have left and will likely continue to leave the farms, the rural educational programs should place as much emphasis on urban living and on nonagricultural occupations as on rural living and on the agricultural occupations, and that the towns and cities of the State and nation should see to it that rural social and educational services are maintained at a high level of efficiency.

The effect of industrialization on the rural community is revealed in a recent survey of the neighborhood around the Alexander-Wilson school in Alamance County. This area was almost entirely agricultural, but 33.3 percent of the workers of this still open-country neighborhood are now employed full time in industrial and

mechanical occupations; 5.6 percent are white collar workers; 35.2 percent are farming part time; and only 25.9 are farming full time. Reduced housing space appears to be the most serious consequence of the industrialization of this area. Full-time farm families average only 4.5 persons per house, but part-time farm households have 5.7 persons per house, and because of this, most frequently live "doubled-up," that is, more than one family or couple per house. Social participation and the development of community-wide organizations is increasingly handicapped by industrialization that brings families of widely varying interests and working schedules into the area. The part-time farmer has high social standing, stability of residence, possession of facilities that lead to participation, and a secure type of family situation, but on the other hand are lack of leisure, employment of wife, and, most significantly, the dual-occupational role maintained and a rather mixed living environment, with interests divided between the factory and farm and between town and country. His neighbors, usually farmers and industrial workers, have interests different from his own, and spend most of their time working at various occupations in scattered locations. These divisions prevent unity within his community and do not encourage group ideas and group effort.

Three out of every 10 farms have a labor shortage, but the remaining 7 have more than enough surplus labor, if it could be distributed, to meet the deficit on the others. Less than 15 percent of the farms under 12 war units have a labor shortage as compared with 58 percent for farms with 32 or more war units. In general, the farms qualifying for less than 12 war units need less than half of their available labor, while farms qualifying for 32 or more units actually have 4 percent less labor than they need. On farms with a labor shortage, the labor available is, on the average, only 72 percent of the labor needed. The few small farms having labor deficits have only half of the labor needed.

An encouraging note is that so many of the outstanding professional and business men living in villages and towns were reared on farms and retain a fundamental interest in agriculture. In a study of 385 white leaders in four rural counties of North Carolina it was found that 162 of the men had a second occupational field, 20 being farmers by first or major occupation. All but 7 of these owned and closely supervised the operation of farms. Over one-half of the 87 business men included in the survey owned farms in addition to running their businesses. Exactly one-half of the 40 physicians found enough time and interest to own and at least to supervise the operation of farms. Almost one-half of the 56 lawyers and over one-third of the 45 school men were also actively engaged in farming as a secondary occupation.

[Social aspects of postwar planning] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1944, pp. 56-61, 76-78*).—The Department's postwar planning, in addition to efforts to acquaint farmers with the facts concerning their interests in markets here and abroad, includes many items of better rural living. About three-fourths of the States participating in postwar planning activities are giving special attention to rural health and sanitation. They recognize the need for positive action to reverse recent unfavorable trends in rural health personnel and facilities. Programs for improved farm housing must consider the extent to which farms provide effective opportunities for it, based preferably on farm-income resources sufficient to pay operating expenses, cover family living expenses, and provide for necessary capital expenditures or debt payments. Otherwise, farm housing improvement lacks a proper economic foundation. A working group of the Department's interbureau postwar planning committee has been created to study the record and make recommendations as to future rural public works programs.

The effects of the war on rural life were found to vary with the distance of rural communities from larger cities, with the nature and significance of local industrial

production, with types of farming, with the development of military establishments and reservations, and with the proximity of rural communities to important defense zones. Wartime production conditions have encouraged many rural families to cooperate to a greater extent with their neighbors in easing various wartime problems, particularly those related to transportation, manpower, and equipment.

The social participation of rural young married couples, W. M. SMITH, JR. ([New York] *Cornell Sta. Bul.* 812 (1944), pp. 31, illus. 2).—A majority of the 50 young married people in this study participated in no organizations of the community regularly, but found their group contacts with relatives and more especially with other young couples of similar social status. Those who were participants in organizations had a greater number of intimate associates than did the non-participants. Frequent mobility of either occupation or residence limited the group participation, as those who moved most often developed no "roots" in the community. The young married people had more formal education than the average of the community, and among them the participants had more years of schooling than had the nonparticipants. Family relationships, or the ability of either spouse to make adjustments to the other, affected their participation in group activities. The presence of children in the family did not of itself prevent the social participation of the parents, as this was dependent on other factors such as economic status, residence, and participation experience. Most of the participating young married couples did so together, and couples were generally interested in having more time to do things at home, just to be together.

Wartime movement of rural youth: A study of Randolph County, Illinois, D. E. LINDSTROM (*Illinois Sta.*, 1943, RSM-12, pp. 94, illus. 1).—From 1941 to 1943, induction into military service was the chief reason for movement involving 39.5 percent of the youth in Randolph County. The heaviest movement of young men occurred in the 20-23-yr. age group, 54 out of 100 leaving the county. In the 28-30-yr. age group, less than one-third moved. Movement of young women was greatest in the 18-19-yr. age group. Over one-half of the migrating young men entered military service, one-fourth moved to towns and cities, and only one-tenth moved to other farms. Of the migrating young women, two-thirds moved to towns and cities and about one-tenth to other farms. There was a 100 percent increase in the number of young men who became renters and of young women who became the wives of renters. During this period young farm people were rapidly elevated from family helpers to paid laborers, renters, and partners. Of the young men not in the armed services or on farms, almost one-third were in nondefense work and one-fifth in defense work. One-half of the young women were wives of nonfarm workers, over one-fifth were in nondefense work, and only one-seventeenth were in defense work. It was concluded that the fact that one-fourth of the young people have left the farms in Randolph County will affect the rate of production in that county. The 15 percent leaving in 1942 had already done so, and an additional 12 percent leaving in 1943 increased the seriousness of the situation. Most families who have had youth move away reported no one available to fill their places. Over 90 percent of the places left by young women were not filled. Vacancies caused by young men leaving the farms were usually filled by younger brothers or sisters.

Prewar living standards on farms of Mississippi lower than United States average, D. W. PARVIN (*Miss. Farm Res.* [Mississippi Sta.], 8 (1945), No. 2, pp. 1-2).—The author states that throughout the years Mississippi has ranked at or near the bottom in all studies dealing with standards of living in rural districts. For example, it was found that only 18.3 percent of the farms had automobiles; 2.8 percent had telephones; dwellings not needing major repairs, 62.1 percent; rural farm dwellings having running water, 3.2 percent; farms having toilet of any type,

80 percent; dwellings having electric lighting equipment, 8.5 percent; rural farm families having radios, 28.4 percent; having refrigeration equipment, 23.3 percent; and having 1.5 persons or less per room, 74.4 percent.

The health and medical-care situation in rural Virginia, L. B. TATE (*Virginia Sta. Bul.* 363 (1944), pp. 51, illus. 8).—Virginia's infant, maternal, and general death rates are higher than similar rates for the nation. The expected life span of her people is shorter. Mortality rates by broad classified causes are higher for Virginia in 12 cases out of 18. Virginia has had a relatively high defect rate among the men examined for the past two world wars. Her tuberculosis and syphilis death rates are much higher than the average for the nation. White-Negro comparisons show that in practically all cases considered, the health status of Negroes is worse than that of whites. Rural-urban comparisons show that in a majority of instances, rural health conditions are worse than the urban. There is a definite shortage of physicians, dentists, and nurses in several parts of Virginia. In some counties, there are more than 5,000 persons per physician compared with the suggested standard of one for every 1,500 persons thought necessary to provide adequate service. In some rural regions, there are more than 10,000 persons for every dentist. The 112 hospitals and sanitoriums in Virginia are located mainly in cities and are poorly distributed for serving all the people easily. Less than one-third of the local hospitals for general use are in rural territory where we find two-thirds of the people. The inaccessibility of doctors and hospitals to many rural families and the high cost in proportion to meager farm incomes is resulting in many rural people going without adequate medical care. This neglect apparently results in an undue amount of chronic illness. Future alternatives for providing more adequate health and medical services include an expansion of the present health-serving agencies. Prepayment plans for hospital, surgical, and medical care are still in their infancy in Virginia, and consequently have many limitations. As they develop and mature they should be in position to provide relatively more service and reasonable rates, and thereby encourage their more widespread use. The laymen and medical men of the State should cooperate in a program for overcoming many of the present health hazards and in meeting the high medical costs in more efficient and effective ways; and, it is concluded that the medical profession must become less money-minded before the masses can have and pay for adequate medical care.

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

History of agricultural education of less than college grade in the United States, R. W. STIMSON and F. W. LATHROP ([U. S.] Fed. Security Agency, Off. Ed., Vocat. Div. Bul. 217 (1942), pp. 648+, illus. 7).—This is a condensation of the reports of groups (170 contributors) designated in each of the States, Hawaii, and Puerto Rico. Part 1 deals with historic background common to all States, includes the summaries of histories by States, and an article, Vocational Education in Agriculture at Indian Schools, by W. I. Goodwin (pp. 487-498). Part 2, Federal Administration of Vocational Education Acts, includes articles as follows: Vocational Agriculture and the Agricultural Service, U. S. Office of Education, by J. A. Linke (pp. 499-511); Development of Part-Time and Evening Instruction, by R. W. Gregory (pp. 512-514); Teacher Training in Agriculture, by H. B. Swanson (pp. 515-531); Student Organizations—Future Farmers of America, by W. A. Ross (pp. 532-551), and New Farmers of America, by W. N. Elam (pp. 551-558); Subject Matter in Agricultural Education, by W. A. Ross (pp. 559-562); and Research in Agricultural Education, by F. W. Lathrop (pp. 563-565). Part 3, Growth and Trends in Vocational Agriculture, includes the following articles: Organizations Aiding the Development of Agricultural Education—American Vocational Association, by L. H. Dennis (pp. 567-569), Contribution of the United

States Department of Agriculture to Agricultural Education of Less Than College Grade, 1904 to 1917, by C. H. Lane (pp. 570-573), Contributions of the United States Department of Agriculture to Agricultural Education of Less Than College Grade, 1917-1929, (pp. 573-574), and American Association for the Advancement of Agricultural Teaching (pp. 547-577), both by E. H. Shinn (U. S. D. A.), and Livestock Judging Contests for Vocational Students, by C. H. Lane (pp. 577-581); Home Project Teaching and Related Educational Developments, by R. W. Stimson (pp. 582-606); and Trends in Vocational Education in Agriculture, by F. W. Lathrop (pp. 607-621). The references for each State and the membership of the Federal boards for vocational education, 1917-18 to 1939-40, and the members of the Agricultural Education Service, U. S. Office of Education, are included.

**Channeling research into education**, J. E. IVEY, JR. (*Amer. Council Ed. Studies, Ser. 1, Rpts. Coms. and Confs.*, 8 (1944), No. 19, pp. 187+).—Part 1 of this report, prepared for the Committee on Southern Regional Studies and Education by its executive secretary, deals with what should be the scope, emphasis, and conceptual framework for the study of regional resources and problems so as to present the research facts effectively and the formulation of specific suggestions for the conduct of resource study in the South. Part 2 discusses the problems of distribution and use of materials produced from research findings.

**Evaluation of rural community planning in relation to the curriculum of rural education**, C. E. RAGSDALE. (Univ. Wis.). (*Jour. Ed. Res.*, 38 (1944), No. 4, pp. 286-290).

**Report of cooperative extension work in agriculture and home economics**, 1944, M. L. WILSON (*U. S. Dept. Agr., Ext. Serv. Rpt.*, 1944, pp. 24).—This report to the Administrator, War Food Administration, for the year ended June 30, 1944, describes briefly the recent accomplishments in different fields and includes statistics on number of counties with county extension agents, sources of funds, and expenditures in the States, Alaska, Hawaii, and Puerto Rico.

**Matching men and farms**, F. R. ZERAN ([U. S.] Fed. Security Agency, Off. Ed., *Vocat. Div. Bul.* 229 (1944), pp. 38+, illus. 7).—This bulletin on guidance for farm youth discusses the need for selection procedure, the work of a farm operator, the determining of farming opportunities, the factors determining aptness of an individual as a farm operator, and the steps to be taken by a counselor. The appendix includes the following forms: Suggested questionnaire to use in helping young men to analyze the opportunity offered by the home farm, form for local survey of opportunities in farming, individual farm survey of placement opportunities in farming, and individual record form.

**Livestock farming: A self-teaching course**, W. JACKSON (*Madison, Wis.: U. S. Armed Forces Inst.*, 1944, pp. 310+, illus. 73).—This War Department Educational Manual (EM 815) gives the essence in popular form of production, management, and feeding of the various classes of animals.

**How to survive on land and sea: Individual survival** (*Annapolis, Md.: U. S. Naval Inst.*, 1943, pp. 264+, illus. 324).—This manual was prepared to meet the need for essential yet comprehensive information on the technic of survival under unusual conditions. Its scope is indicated by the following general subject headings: Survival hints, orientation and traveling, water, wild plant food, wild animal food, firemaking and cooking, shelter, survival in special areas, and environmental hazards. Selected readings, a glossary, and a subject index are included.

**Teacher supply and demand in home economics in Iowa, 1935-1941**, H. CHADDERDON (*Iowa Sta. Res. Bul.* 335 (1945), pp. 489-624).—The study is based on data from 15 colleges and universities within the State, graduates, placement officers, and the Iowa school directories and the State Department of Public Instruction. A study was also made in one institution to discover the reasons why home economic students prepared to teach plan to enter other fields.

The 15 colleges and universities during the 6-yr. period prepared 1,051 students to meet State requirements for teaching home economics in secondary schools, of whom 183 were residents of other States or countries. Of the students prepared, 76.3 percent gave some service to the Iowa high schools. Of 271 not teaching in the secondary schools of the State immediately after completion of their courses, 100 taught in other States or at other school levels. At the end of the preparatory period, the Agricultural Extension Service and the Farm Security Administration took 29; full-time homemaking, 40; commercial positions, 46; 17 continued as students; 12 were unemployed; and records of subsequent employment were not obtained for 17. During the 6-yr. period, 44.5 percent of those teaching in the State left the field. Seventeen were unemployed all or part of the year following withdrawal from the Iowa school system, and no information was obtained on 38. Of the remainder, approximately 64 percent became homemakers, 15 percent taught in other States, 8 percent studied, 8 percent became members of the Extension Service or Farm Security Administration, and 6 percent were in commercial positions. The total number of home economics teachers employed in secondary schools of the State increased from 885 to 962 during the period. The proportion of Iowa-prepared teachers remained approximately 80 percent throughout the 6 yr. Of the new teachers, 93 percent were prepared by institutions in the State.

## FOODS—HUMAN NUTRITION

The chemistry and technology of food and food products, II, edited by M. B. Jacobs (*New York: Interscience Pubs., 1944, vol. 2, pp. 890+, illus. 166*).—This volume (E. S. R., 92, p. 2), completing the set and written by 27 collaborators, is presented in four parts (3-6). The chapter on unit opérations and processes (3) is written by K. M. Gaver (pp. 3-98) (Ohio State Univ.). Sanitary and quality control (4) is discussed under the headings: Food Supervision by Government Agencies, by J. Trichter and S. Pincus (pp. 101-131); Food Grading—Sanitary and Quality Control, by T. A. Samuelson (pp. 132-160); Food Machines, by A. E. Abrahamson (pp. 161-210); Washing, Detergency, Sanitation, and Plant Housekeeping, by J. L. Wilson (pp. 211-241); Insect Control—Insecticides and Fungicides, by H. H. Shepard (pp. 242-266) (Univ. Minn.); and The Prevention and Control of Rodent Life, by B. E. Holsendorf (pp. 267-279). Preservation (5) deals with The Dehydration of Foods, by E. M. Mrak and G. Mackinney (283-311) (Univ. Calif.); Food Preservation by Temperature Control, by D. K. Tressler (pp. 312-335); The Preservation of Food in Hermetically Sealed Containers, by O. B. Williams (pp. 336-361); Food Preservation by Use of Microorganisms, by F. W. Fabian (pp. 362-393) (Mich. State Col.); Chemical Preservatives, by M. B. Jacobs (pp. 394-424); and Packaging, by C. W. Browne (pp. 425-448). The section on production (6) includes the following: Technology of Cereal Grains, by W. F. Geddes (pp. 451-515) (Univ. Minn.); The Production of Bread and Bakery Products, by W. H. Cathcart (pp. 516-536); Sugars and Sirups, by M. B. Jacobs (pp. 537-562); Confectionery and Cacao Products, by M. Schoen (pp. 563-590); Fruit Juices, Jams, Jellies, and Preserves, by A. M. Neubert and J. L. St. John (pp. 591-616) (Wash. Expt. Sta. and U. S. D. A.); Milk and Milk Products, by P. Corash (pp. 617-648); Meat and Meat Products, by W. M. Urbain (pp. 649-687); Oils, Fats, and Related Products, by A. E. Bailey (pp. 688-714) (U. S. D. A.); Nonalcoholic Beverages, by J. F. Hale (pp. 715-732); Alcoholic Beverages, by P. Valaer (pp. 733-803); and Industrial Waters, by F. C. Nachod and E. Nordell (pp. 804-833).

The forty-eighth report on food products and the thirty-sixth report on drug products, 1943, E. M. BAILEY ET AL. (*Connecticut [New Haven] Sta. Bul. 482 (1944), pp. 327-355*).—This report (E. S. R., 90, p. 848) summarizes examinations of official samples of foods, drugs, and cosmetics submitted by the Dairy and Food

Commissioner during the calendar year 1943. The examinations of foods involved special attention to decomposition or contamination, faulty labeling, deceptive packaging, and substitutions of various edible vegetable oils for olive oil without proper declaration.

**Culinary preparation and use of soybeans and soybean flour**, F. BOWMAN, L. MAHARG, M. MANGEL, M. McDIVITT (*Missouri Sta. Bul. 485 (1945)*, pp. 28, illus. 7).—This bulletin presents a well-rounded discussion of the nutritive value of soybeans and considers the place of the soybean in American diets. Suggestions, precautions, and tested recipes are presented for the use of soybeans and of soybean products available on the retail market. The recipes and recommendations were developed in experimental work, and only the recipes for products rated as excellent are presented. Cooking studies with the soybeans were carried out with varieties grown in Missouri. Minimum-fat, low-fat, and high-fat flours were utilized in the study of the effect of substitution of these three types of soya flour for part of the wheat flour in standard recipes. Analyses credited to the station department of agricultural chemistry are presented for moisture, ash, protein, and fat content of several commercial brands of each type of flour; data are also given on the average weight in grams per cup. The recipes cover the utilization of soybeans as baked soybeans, soybean salad, and soybean soup, and of soybean products as meat extenders in the preparation of soybean meat loaf, fried soya mush, and fried soya scrapple. Recipes for soya baked goods include recipes for biscuits, cakes, cookies, corn bread, muffins, pastry, and yeast breads.

**Trends in freezing preservation of foods**, V. D. GREAVES and M. M. BOGGS. (Univ. Calif. and U. S. D. A.). (*Jour. Home Econ.*, 37 (1945), No. 1, pp. 23-26). This is a summary discussing later developments in freezing procedures, nutritive values of frozen foods, and some of the newer frozen products, including precooked frozen dishes.

**The need for betterment of children's diets**, J. D. BOYD (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 3, pp. 147-149).—This report summarizes the completed observations of the author, with the collaboration of C. L. Drain, on the extent and progress of dental caries in more than 100 diabetic children under diet supervision over periods exceeding 3 yr. for each child and averaging 5 yr. Of this number, 55 observed for 3 yr. or more after they had shed all carious deciduous teeth were used as the basis of a detailed analysis of the extent of tooth decay, leading to the general conclusion that the incidence and rate of progress of tooth decay in these children has been reduced to a negligible level. In discussing the agencies associated with the diet that have led to the prevention of tooth decay, the author rules out fluorine, the percentages of fat and carbohydrate in the diet, and the restriction of sugar (E. S. R., 92, p. 138). It is thought, however, that caries can be lessened in the general child population through dietary means and that the matter of betterment of diet practices is essentially one of education. Among commonplace practices considered to carry with them great hazards of diet inadequacies are breakfast small, poorly chosen, or omitted; lunch eaten away from home routinely; eating practices not supervised by an adult; responsibility for food choice left to the child; limitation or prohibition of any of the calorie foods; no inclusion of fish liver oil or its equivalent; failure to eat meat, eggs, or equivalent foods daily; and failure to eat liberal servings of vegetables and fruits daily. "Few children escape inclusion in one or more of the categories mentioned. The problem of assuring proper diets is thus fundamentally related to habits of living. Any program designed to better conditions must take these factors into account. With re-education of families and with greater insight on the part of professional workers, we may hope to see these predictable factors diminishing in significance."

**Hemoglobin concentrations, red cell counts, and erythrocyte volumes of college women of the North Central States**, M. A. OHLSON, D. CEDERQUIST, E. G.

DONELSON, R. M. LEVERTON, G. K. LEWIS, W. A. HIMWICH, and M. S. REYNOLDS, ET AL. (Iowa, Kans., Minn., Nebr., Okla., and Wis. Expt. Stas.). (*Amer. Jour. Physiol.*, 142 (1944), No. 5, pp. 727-732, illus. 3).—This paper, presented as No. 24 of the regional project of the North Central States relating to the nutritional status of college women, gives hematological data on a total of 4,550 active college women between the ages of 16 and 30 yr. (90 percent between 17 and 24 yr.) in Iowa State College, Kansas State College, University of Minnesota, University of Nebraska, Oklahoma Agricultural and Mechanical College, and the University of Wisconsin. The data were accumulated from September 1935 through May 1943. Hemoglobin was determined on capillary blood by the acid hematin method with readings in a Duboscq colorimeter in the majority of cases, although some determinations were made on venous blood by the oxyhemoglobin method with readings in a Sheard Sanford photometer. For red cell counts, two trenner pipettes were used, and two counting chambers of the improved Neubauer counting instrument were filled from each pipette and 80 small squares counted from each chamber, a total of four counts for each blood sample. Cell volume was determined by means of the Van Allen tube. The data, presented separately for each school, indicated some variation between schools, with the minimum average hemoglobin concentration of 13.0 gm. per 100 cc. for the Minnesota group, and the maximum of 13.7 gm. per 100 cc. for Wisconsin. In general, the erythrocyte counts and cell volumes followed the variations in hemoglobin. The Minnesota women, for example, had the minimum average red count of 4.23 million cells per cubic millimeter, while the count of 4.75 million for the Wisconsin women was the highest. The mean hemoglobin concentration for all subjects was 13.4 gm. per 100 cc. of blood, with a standard error of 0.017. Mean erythrocyte count was  $4.56 \pm 0.009$  million cells per cubic millimeter, and mean cell volume was  $40.0 \pm 0.07$  percent.

"Maximum ranges of variation for each of the three tests reported in this paper are: Hemoglobin, 8.5 to 17.5 gm. per 100 cc. blood, erythrocyte count 3.11 to 5.91 million cells per cubic millimeter, and cell volume 32.0 to 48.1 percent. The series here reported is much larger than any previously recorded, and the ranges found for erythrocytes and total cell volume are no greater than those for hemoglobin since, in each case, the mean plus or minus two standard deviations measures a range 17, 13, and 17 percent of the respective means. That the measures should yield similar degrees of variation is to be expected since the physiological relationship of the tests is obvious. However, these figures suggest that if only one measure of the normalcy of the red blood cell system is to be obtained, the erythrocyte count may be subject to less sampling variation than either of the other two tests. In all schools, variations in the yearly samples from each State were at least as wide as the variations between States."

Hemoglobin regeneration in dogs receiving a purified ration plus succinyl-sulfathiazole, L. MICHAUD, A. R. MAASS, W. R. RUEGAMER, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 56 (1944), No. 2, pp. 148-150, illus. 1).—"Succinylsulfathiazole was fed to dogs at levels varying from 0.5 to 4 percent of the ration in an attempt to modify the intestinal flora and cause a deficiency of factors possibly synthesized in the digestive tract. No differences were observed between the animals receiving the drug and those serving as controls. Hemoglobin per 100 gm. of blood, total hemoglobin in the dogs, red blood cells, mean cell volume, food consumption, growth increase, and general state of health were taken into consideration."

Nutritional requirements of the Syrian hamster, J. W. HAMILTON and A. G. HOGAN. (Mo. Expt. Sta.). (*Jour. Nutr.*, 27 (1944), No. 3, pp. 213-224).—The nutritional requirements of the hamster as established in the authors' laboratory are discussed, with comments on certain discrepancies between the observations reported

and those of Cooperman et al. (E. S. R., 89, p. 348). The simplest satisfactory diet for growth at a normal rate and attainment of normal mature weights contained vitamins A, D, E, K, thiamine, riboflavin, pyridoxine, and pantothenic acid. In the absence of vitamin E, the animals collapse and die in 4-18 weeks unless vitamin E is administered shortly after collapse. In the absence of vitamin K, growth is irregular and the animals develop small hemorrhagic areas but reach maturity in nearly normal time. In the absence of both vitamins E and K, the animals become severely hemorrhagic and die, apparently from the deficiency of E. In the experiments reported, a high percentage of females bore at least one litter on simplified diets containing nicotinic acid, choline, and inositol in addition to the vitamins required during growth. It has not been determined whether vitamin C,  $\beta$ -aminobenzoic acid, and biotin are essential. As few females bore a second litter, it was concluded that the hamster required at least one unrecognized vitamin for reproduction.

**Effect of high protein (meat) diet on mortality from surgical shock due to repeated hemorrhage,** R. ELMAN and H. W. DATEY (*Soc. Expt. Biol. and Med. Proc.*, 56 (1944), No. 2, pp. 208-209).—Dogs given a high protein diet consisting entirely of horse meat for periods of 3 and 5 weeks before repeated fatal hemorrhage withstood significantly greater loss of blood than dogs kept on a normal (Purina chow) or nonprotein diet.

**Fractions derived from soy beans and navy beans which retard tryptic digestion of casein,** D. E. BOWMAN. (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 1, pp. 139-140).—Aqueous extracts of soybeans and navy beans were found to inhibit pancreatic digestion of casein. Treatment of the extracts with 90 percent acetone very largely precipitated the digestion-retarding fraction; 90 percent ethyl alcohol precipitated the fraction from the navy bean extract only. Heating the aqueous extract of navy beans at pH 4 and that of soybeans at pH 4-5 for 15 min. decreased the activities of the inhibiting fraction to about one-fourth of the original values. The presence of this fraction may account for the low nutritive value of raw soy and navy beans.

**Methionine deficiency in yeast protein,** A. A. KLOSE and H. L. FEVOLD. (U. S. D. A.). (*Soc. Expt. Biol. and Med. Proc.*, 56 (1944), No. 2, pp. 98-101, illus. 2).—Commercial brewers' yeast and a pilot plant product of *Torulopsis utilis* grown on molasses were fed to young rats as the sole source of dietary protein at a crude protein ( $N \times 6.25$ ) level of 16 percent. Neither of these yeasts supported even moderate growth, but the addition of 0.5 percent of *dl*-methionine alone to these yeast diets resulted in a growth rate equal to that obtained with a diet containing 16 percent casein.

**Inhibitory effect of certain amino acids on growth of young male rats,** S. W. HIER, C. E. GRAHAM, and D. KLEIN (*Soc. Expt. Biol. and Med. Proc.*, 56 (1944), No. 2, pp. 187-190, illus. 3).—Rats fed gelatin alone at a 20-percent level in the diet as the sole source of nitrogen showed loss of weight; when the gelatin was supplemented with all reported essential amino acids, there was slight gain in weight; but a still greater gain was obtained by feeding the amino acids alone as the source of nitrogen. To determine whether the inhibiting effect of the gelatin might be due to its marked amino acid imbalance, notably its high glycine and proline content, feeding experiments were performed comparing growth on good basal diets with and without the addition of single amino acids. These tests showed that glycine at 6 percent or *l*-proline at 5 percent of the diets used had an inhibitory effect on growth, and that a still greater inhibitory effect was exerted by *dl*-phenylalanine at 5 percent. These effects were not due to the high nitrogen intake alone, since 50 percent casein, supplying still higher levels of nitrogen, had no deleterious effect. It is considered that the inhibitory effect of glycine and proline on growth may explain the difficulty in supplementing gelatin for optimum growth.

Rancid fat in experimental diets, O. G. FITZHUGH, A. A. NELSON, and H. O. CALVERY (*Soc. Expt. Biol. and Med. Proc.*, 56 (1944), No. 2, pp. 129-131, illus. 1).—Young rats on an experimental diet containing 6 percent lard compared favorably in growth rate for about the first 3 mo. with rats on a similar diet containing 6 percent corn oil in place of the lard. After about a year on the restricted diets the corn-oil animals were normal, while those on the lard diet developed outward signs and pathological lesions similar to those found in vitamin E deficiency. The lard and the rations containing it were stored at 35° F., but organoleptic tests on both of these and peroxide numbers of the lard indicated the development of rancidity in the lard. "The observations are of particular importance in chronic toxicity studies in which animals are maintained on experimental diets for long periods of time."

Response of rats to diets containing propylene glycol and glycerol, G. P. WHITLOCK, N. B. GUERRANT, and R. A. DUTCHER. (Pa. State Col.). (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 1, pp. 124-125).—This is a preliminary report of experiments covering a 20-week period in which young rats received glycerol or propylene glycol, respectively, at levels of 1, 3, 6, 10, 15, 20, 30, 40, 50, and 60 parts per 100 of the total ration replacing starch in the purified basal diet which consisted of casein, Cell-U-Flour, salt mixture, butterfat, cod-liver oil, brewers' yeast, and cornstarch. No marked difference in growth response was observed until the alcohols were fed at the 30-percent level, at which the propylene glycol animals grew less readily than those receiving the glycerol; at higher levels of propylene glycol young animals soon died, while on glycerol the growth was depressed but only a few deaths occurred; glycogen was higher in the livers of the glycerol-fed rats. Replacing starch by glucose in the basal ration did not alter the results. In metabolism studies in which half-grown rats received comparable diets containing increasing amounts of glycerol or propylene glycol during alternate weeks, the greatest percentages of water, thiamine, and polyhydric alcohol were excreted in the urine in the weeks when propylene glycol was fed. At the highest level of intake, more than 25 percent of the ingested propylene glycol but not more than 1.5 percent of the ingested glycerol was accounted for in the urine. In reproduction studies in which the alcohols were fed at the 30 percent level, with the breeding colony diet at 70 percent, the rats receiving the glycerol were in the fifth generation while second-generation young had not yet been successfully weaned by the propylene glycol-fed mothers.

Chronic toxicity and hypercalcemic effects of various activated sterols in the albino rat, E. W. MCCHESEY (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 1, pp. 29-31).—Adult white rats on a breeding diet (analysis: Ca, 0.49 percent; P, 0.53 percent) were given medications of activated sterols in corn oil, administered by stomach tube. The medications, ranging in concentration from 0.8-2.4 mg. per cubic centimeter, were given daily until death. The equivalent toxic doses of the preparations defined as the milligrams per kilogram per day permitting a median 20-day survival time indicated that crystalline vitamin D<sub>3</sub> was about 55 percent and commercial dihydrotachysterol about 260 percent more toxic than crystalline vitamin D<sub>2</sub>. The toxicities of vitamins D<sub>3</sub> and D<sub>2</sub> correlated very well with the hypercalcemic effects of the preparations, but the ability of dihydrotachysterol to elevate serum calcium was not proportional to its high toxicity. "In view of the difference in response of different species, these considerations do not necessarily apply to any species other than the albino rat."

Effect of parenterally administered citrate on the renal excretion of calcium, G. GOMORI and E. GULYAS (*Soc. Expt. Biol. and Med. Proc.*, 56 (1944), No. 2, pp. 226-228, illus. 2).—The subcutaneous injection of 8-30 cc. per kilogram of 4-percent solution of sodium citrate into dogs caused a pronounced and prompt increase in the urinary excretion of calcium; this excretion reached a high level in 60 min.,

then gradually declined to the normal level within 5 hr. after injection. The increase of phosphate followed no typical course except for a tendency to a late increase in excretion. The blood levels of both calcium and phosphate remained unchanged. The marked increase in urinary calcium excretion indicated that a larger fraction of the plasma calcium became ultrafiltrable. The bone changes observed microscopically in puppies and young rats given repeated subcutaneous injections of citrate were similar to those produced by large doses of parathormone.

The time factor in the production of gastric lesions on low calcium diets, T. F. ZUCKER and B. N. BERG. (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 1, pp. 1-3, illus. 1).—In earlier studies (E. S. R., 89, p. 768) antral gastric lesions were produced in rats within a 28-day period on a low calcium diet. Subsequent study showed that time was a factor, and that keeping the rats for longer periods of time on the low calcium diets accentuated the ulcerative as well as the hyperplastic hemorrhagic character of the antrum lesions. It also brought out a generalized tendency to bleeding. There was no perceptible change with regard to penetration, however, and the lesions remained superficial.

The vitamin content of commercial winter goat's milk, A. D. HOLMES, H. G. LINDQUIST, C. P. JONES, A. W. WERTZ, K. ESSELEN, B. V. McKEV, and E. FULLER. (Mass. Expt. Sta.). (*New England Jour. Med.*, 232 (1945), No. 3, pp. 72-76).—The 18 samples of raw goat's milk used were produced under routine conditions from normal healthy animals and were shipped packed in cracked ice in the usual glass or paper carton containers by producers from 18 different localities within a radius of 100 miles from the laboratory. Some samples were from single animals while others were from mixed herd milk. Nubian, Saanen, and Toggenburg breeds were represented, the animals being mostly in the latter half of the lactation period and about 4 yr. old on an average. All samples were obtained at the end of April from goats that had received a winter ration of hay and commercial grain mixtures for 5 or 6 mo. previously. Fat content averaged 4 percent (range, 3.1-5.6 percent), the pH averaged 6.37 (range, 6.13-6.62), and the several vitamins showed the following averages (and ranges) in milligrams per liter: Ascorbic acid 6.5 (0.2-14.7), niacin 2.96 (1.79-3.81), pantothenic acid 3.38 (2.01-6.46), riboflavin 1.25 (0.89-2.16), and thiamine 0.45 (0.20-0.50).

Effect of high-temperature-short-time pasteurization on the ascorbic acid, riboflavin, and thiamin content of milk, A. D. HOLMES, H. G. LINNQUIST, C. P. JONES, and A. W. WERTZ. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 1, pp. 29-33).—High-temperature, short-time pasteurization had little effect on the content of vitamins in 20 samples of milk. The average values of the vitamin assays were, per liter of raw milk, ascorbic acid 16.4, riboflavin 1.5, and thiamine 0.36 mg., as contrasted with respective values of 16.6, 1.5, and 0.35 mg. for these vitamins after pasteurization.

Some problems in riboflavin and allied deficiencies, H. S. STANNUS (*Brit. Med. Jour.*, Nos. 4359 (1944), pp. 103-105; 4360, pp. 140-144).—In this abridgment of two lectures delivered before the Royal College of Physicians of London, the author reviews earlier observations of his own and others on the syndrome referred to in earlier publications as a "pellagra-like condition" or "pellagra sine pellagra" and later attributed to riboflavin deficiency, and suggests "a tentative explanation of the pathogenesis of the signs and symptoms of riboflavin deficiency and of their peculiar localization, based on an anatomico-physiological consideration of the capillary vascular system". In amplification of this theory, the action of riboflavin in the body, the role of the capillaries, and the signs and symptoms of hyporiboflavinosis (a term preferred to a-riboflavinosis) are discussed, the latter under the headings angular stomatitis, ocular manifestations, neurological symptoms, capillarity of nervous tissues, and pathology.

In summary, the belief is expressed "that the first tissue to suffer the effects of riboflavin deficiency is the endothelium of the capillary system; that the initial result is a reversible functional disturbance of the capillaries—a 'capillary dysergia'—which at the present time cannot be more accurately defined, but which is manifested by dilatation of these vessels and impaired flow; that in turn there is an interference with the normal cellular metabolism and in consequence a derangement of tissue function by disturbance in the milieu intérieur; and that the derangement of tissue function is relatively greatest in those tissues which possess the highest degree of capillarity and whose metabolism is greatest. So long as the intensity of the functional disorder be not too great and so long as it does not persist too much, complete recovery may take place, otherwise irreversible processes occur which lead to pathological changes."

**Physiological and biochemical functions in normal young men on a diet restricted in riboflavin.** A. KEYS, A. F. HENSCHEL, O. MICKELSEN, J. M. BROZEK, and J. H. CRAWFORD. (*Jour. Nutr.*, 27 (1944), No. 2, pp. 165-178).—Studies similar to those previously reported for thiamine restriction (E. S. R., 92, p. 149) were made on six normal men students subsisting on a diet furnishing on an average 0.99 mg. of thiamine, or 0.31 mg. per 1,000 Calories, daily. The period on the restricted diet was preceded by 3 weeks of control observations, and was continued for 84 days for three subjects and 152 days for the other three, who were also studied during 12 weeks of restoration of the riboflavin. Standardized work tests and clinical and physiological observations gave essentially negative results as regards evidence of riboflavin deficiency. The 24-hr. urinary excretion of riboflavin averaged 12 percent of the dietary intake, and the recovery of saturation test doses of 1.0 mg. was very similar with no progressive changes in either regular or saturation excretion.

"The present results indicate that normal young men suffer no physiological or clinical handicap by restriction to an intake of riboflavin of 0.31 mg. per 1,000 Calories for a period of 5 mo. Longer periods and very young or aged people may be another matter. However, we are unaware of evidence on these points. Undoubtedly such a restricted diet does not provide a body reserve as large as would result from a greater intake."

**Water-soluble vitamins in sweat.** F. SARGENT, P. ROBINSON, and R. E. JOHNSON (*Jour. Biol. Chem.*, 153 (1944), No. 1, pp. 285-294).—In view of conflicting data in the literature on the loss of water-soluble vitamins in sweat and the importance of this problem in tropical and desert nutrition, an extensive investigation was carried out in which 11 healthy young men on a good normal diet and in all stages of acclimatization served as subjects. In each experiment, the men sweated approximately 1 l. per hour while marching in a heated room under desert or moist tropical conditions. The sweat, which was collected in two ways—first in elbow-length rubber gloves and second in scrapings from the body with a glass vessel—was analyzed by a variety of methods for ascorbic acid, dehydroascorbic acid, thiamine, diphosphothiamine, riboflavin, nicotinic acid, and factors F<sub>1</sub> and F<sub>2</sub>. Of all of these vitamins, only dehydroascorbic acid and nicotinic acid could be detected in the sweat, the former in half of the 16 samples tested in amounts not exceeding 0.2 mg. per 100 cc. and the latter in a majority of the 40 samples tested in a concentration not exceeding 0.1 mg. per 100 cc. Rat assay of sweat concentrated in vacuo also failed to show the presence of thiamine. From these findings and a review of the work of investigators who have employed the most specific methods and acceptable technic in collecting and handling the sweat, the authors concluded that "loss in the sweat is not a significant factor in depleting the body's stores of water-soluble vitamins." A tabulated summary of the literature on the subject is appended.

**The utilization of thiamine in the human subject: The effect of high intake of carbohydrate or of fat.** J. G. REINHOLD, J. T. L. NICHOLSON, and K. O. ELSOM (*Jour. Nutr.*, 28 (1944), No. 1, pp. 51-62, illus. 3).—In this extension of earlier studies under the same controlled conditions (E. S. R., 88, p. 554), six women who had previously been patients in a ward of a hospital served as subjects, three in April and May and three in November and December. After a preliminary observation period on a normal diet, the subjects received in varying sequence a so-called basal diet, a diet high in fat, and a diet high in carbohydrate. These diets differed only in their proportion of supplements of sugar, jelly or gelatin, and olive oil, the amounts in the basal diet being sugar 43, jelly 60, and olive oil 31 gm., respectively; in the high fat diet sugar 23, gelatin 2, and olive oil 62 gm.; and in the high carbohydrate diet sugar 117 and jelly 60 gm. The thiamine intake was maintained at approximately twice the minimum requirement (except in subject 1 during the basal diet period when it was lower) through the use of a solution given daily at lunch in addition to the thiamine of the food. Thiamine was determined in the urine, feces, and food by the thiochrome method. In the analysis of the data, comparison of means was made by the method described by Goulden for small samples using Fisher's Table of "t" values. Regression lines were calculated by the method of least squares.

All of the subjects showed a trend of rising thiamine excretion during the basal period, whatever the sequence of the different diets. Increasing the carbohydrate content of the diet resulted in decreasing the excretion of thiamine in five of the six subjects. This decrease was manifested by an interruption of a rising trend of excretion in four subjects and a decrease in the mean excretion in one. No differences were observed in the slope of the regression lines on the high fat diet over those on the basal diet, except in the one subject who also showed no effect of the high carbohydrate diet. Excretion of free and total thiamine in the feces was not significantly affected by the change in fat-carbohydrate ratio. The decreased excretion of thiamine during high carbohydrate intake is interpreted as indicating increased need for thiamine in the metabolism of extra carbohydrate with consequent increase in the rate of its destruction. It is suggested that the conflicting results of previous studies of the effect of fat on the thiamine requirement may have been due to marked changes in the carbohydrate content of the diet when the effects of alteration in fat were being sought. References to the literature are cited in support of this suggestion.

For this study, the authors had the technical assistance of C. Chornock.

**The vitamin C content of Maine foods.** E. F. MURPHY (*Maine Sta. Bul.* 426 (1944), pp. 299-305).—Fourteen varieties of strawberries tested on three dates in July 1943 showed decided varietal differences in ascorbic acid content. Six varieties (Senator Dunlap, Dorsett, N. J. 341-35, Julymorn, Fairfax, and Catskill) were particularly rich in ascorbic acid, ranging from 83 to 96 mg. per 100 gm.; in the medium group (Green Mountain, Howard 17, Redwing, Parsons (Gibson), and Haverland) the averages were from 65 to 76, and in the low group (Pathfinder, Sample, and Aberdeen) 46 to 61 mg. per 100 gm. The berries, all picked at the same degree of maturity but without reference to exposure to sunshine, showed a similarity in ascorbic acid content between berries from the same plants on the same date, on different dates, and from separate plants of the same variety.

Four varieties of kale grown in 1940 and analyzed for ascorbic acid at weekly intervals for 6 weeks, and again after 3- and 6-week intervals, gave seasonal averages of 101.1 mg. per 100 gm. for Dwarf Siberian, 109.4 for Special Late Sprouts, 137.5 for Blue Scotch, and 141.5 for Dwarf Green Curled Scotch. Five varieties grown in 1943 also showed the varietal differences in ascorbic acid content, Dwarf Siberian again being low (147 mg. per 100 gm.), although higher than in the 1940

season, Dwarf Green Curled Scotch and Norfolk being intermediate at 160 and 163 mg. per 100 gm., respectively, and Blue Scotch very significantly higher than any of the other varieties, averaging 189 mg. per 100 gm. Inner leaves contained about 34 percent more ascorbic acid than did outer leaves; the amount present increased as the season advanced, but since the leaves analyzed at each date were of the same physiological age, this increase was not an effect of maturity.

Among the 29 varieties of tomatoes analyzed in 1943, several had been analyzed for a number of consecutive seasons. Seasonal differences were apparent, 6 varieties showing significant variations, being at their lowest in 1938 with 23.5 mg. and at their highest in 1940 with 31 mg. per 100 gm. With some overlapping, the varieties maintained their relative rank in any one year, Bestal and Earliana interchanging for fifth or sixth place during 6 yr., and Comet and Best of All being either first or second in five of the six seasons. Ordinarily a superior variety maintained its superiority even under unfavorable conditions. "Unless serious consideration be given to the inherent differences in the vitamin C value of tomatoes, it does not seem justifiable to rate the tomato in the same category with the citrus fruits as an extremely rich source of vitamin C. It is obvious from the data obtained that many of the varieties which are popular with both home and commercial growers are also those on the lower level of ascorbic acid content. These, after undergoing the losses during processing, can hardly be termed even a good source of this food essential. Unless the consumer can be made aware of the desirability of high-vitamin-C tomatoes and the seed of such varieties be made available to the grower, the emphasis on tomatoes as an 'excellent' source of vitamin C and a substitute for citrus fruits is misplaced." In tests with one variety grown in an experimental garden, involving 12 fertilizer treatments with 4 replications, variations between plots were large (25-43 mg. per 100 gm.), but the variations were not correlated with fertilizer treatment.

Ascorbic acid values for 10 varieties of rutabagas analyzed four times during August and September in 1941 ranged from 40.8 mg. per 100 gm. for Bangholm Club Root Resistant to 55.9 mg. per 100 gm. for Large White French. Tests with 2 varieties showed no significant differences in ascorbic acid content associated with fertilizer treatments.

A preliminary study in 1943 of the ascorbic acid content of six varieties of stored Maine potatoes showed varietal differences, with Mohawk and Irish Cobbler having the highest values and Chippewa the lowest. The varieties averaged 17.3 mg. per 100 gm. in October and 6.0 mg. in May. Retention of the vitamin was better in storage at 50°, 65°, and 70° F. than at 32° and 36°, although the quality of the tubers held at the higher temperatures was inferior to that of tubers held at the lower temperatures. Over a 7 months' storage period, ascorbic acid retention was best at 50° and physical appearance best at 36° and 50°. Of the tubers stored at 32°, Katahdin, Chippewa, and Mohawk became severely affected with mahogany browning. At the sixth and seventh months, the flesh of all varieties held at 65° and 70° blackened.

Ascorbic acid content of vegetables as determined by variety and method of processing, M. M. CLAYTON, B. O. WELLS, C. Goos, and E. F. MURPHY (*Maine Sta. Bul.* 426 (1944), pp. 306-311).—In canning tests, Farthest North A and Farthest North C tomatoes were used, these being, respectively, varieties low and high in ascorbic acid. Juice from tomatoes sieved while hot and whole unpeeled tomatoes were canned by the hot-pack method and analyzed for ascorbic acid the day after canning and at 30-day intervals thereafter. During canning as tomatoes, both varieties lost about 12 percent of their ascorbic acid; canned as juice, the Farthest North C variety lost on an average 25.3 percent, and the Farthest North A, 33.6 percent. In storage the greatest loss occurred in the first 30 days, but a gradual

loss occurred thereafter, so that by the end of 9 mo. the juice of these two varieties had lost, respectively, 36.8 and 49.5 percent of the ascorbic acid present after canning, and the canned tomatoes, 47.5 and 59.5 percent, respectively. The juice of the batch in which the tomatoes were sieved raw lost ascorbic acid more rapidly than that in which the tomatoes were sieved when boiling hot. The juice in the jars containing tin insets lost ascorbic acid less rapidly than those without the tin.

Canning losses in Swiss chard were investigated, using Lucullus and Fordhook Giant varieties, and in spinach with Summer Savoy and Nobel. Both varieties of the chard lost most of the ascorbic acid during the canning process. No additional loss occurred during storage. Both varieties of spinach lost about 40 percent of their ascorbic acid in canning, with no additional loss during storage. Since the raw values for spinach were high, the canned product was about equal in ascorbic acid content to the high-vitamin C varieties of raw tomatoes.

Five varieties of kale contained in the small leaves from 169 mg. of ascorbic acid per 100 gm. for the Dwarf Siberian to 199 mg. for the Blue Scotch. Steaming for the length of time required to give the best flavored product (11-14 min.) caused average losses of ascorbic acid from the raw equivalent value ranging from 8.7 percent for the Tall Scotch variety to 19.4 percent for the Norfolk. Steaming for a longer time caused greater loss of ascorbic acid and less desirable flavor. Raw kale tested immediately after mixing with a hot vinegar sauce lost approximately 40 percent of the raw equivalent value of ascorbic acid. Mixing the raw kale with French dressing caused only a slight immediate loss, a loss of 9 percent after 15 min., and a loss of 23 percent after 30 min.

Rutabagas of the Long Island variety (from Aroostook) contained 421 mg. of ascorbic acid per 100 mg. and of the Macomber variety 35.4 mg. These varieties lost, respectively, an average of 24 and 39 percent of their ascorbic acid when cooked in a casserole.

**Ascorbic acid content of school lunches, F. I. SCOUAR and A. R. BRYAN (*Jour. Home Econ.*, 36 (1944), No. 10, pp. 651-655).**—Data are reported for the ascorbic acid content of fruits, vegetables, and prepared dishes served in the lunchroom of the North Texas State Teachers College Demonstration School on 20 consecutive serving days. Analyses on a total of 498 samples were made at the time the food preparation was completed and at the beginning and the end of the serving period. The best sources of ascorbic acid at the end of the food preparation period were certain combination salads such as (1) tomato, pepper, onion, and lettuce, (2) cabbage, celery, and tomato, and (3) cabbage and green pepper, containing, respectively, 55, 29, and 25 mg. ascorbic acid per 100 gm.; (4) turnip strips, containing 28 mg.; and (5) oranges; (6) fruit cup; (7) fruit jello; (8) grapefruit, orange, and pineapple; and (9) oranges and prunes, containing, respectively, 38, 29, 25, 22, and 22 mg. ascorbic acid per 100 gm. The green salads as first served, 5-15 min. after preparation, contained 75-100 percent of the ascorbic acid originally present as prepared, and at the end of the serving period, 45-55 min. after preparation, 50-84 percent. The turnip strips retained 56 and 55 percent of their ascorbic acid in 49 and 83 min. of holding. The fruit dishes (excluding the unpeeled orange) held 30-55 min. before serving retained from 54-96 percent of the ascorbic acid originally present at the time of preparation and from 54-89 percent after 60-80 min. of holding. Other foods which retained 50 percent or more of their ascorbic acid to the end of the serving period were carrots and peas, liver, candied sweetpotatoes, other cabbage salad variations, and lettuce and tomato salad. Foods which lost all of their ascorbic acid had a low ascorbic acid content of from 0.06 to 3.31 mg. per 100 gm. Foods that were analyzed on several occasions showed variable retentions.

Data are tabulated showing the ascorbic acid content of 5 lunches chosen at random dates and as served, respectively, to primary and elementary children and to high school boys and girls. "When compared with the National Research Council's Recommended Dietary Allowance an adequate quantity of ascorbic acid for any age group was furnished by the school lunch on only 1 day when 96.97 to 98.66 percent of this vitamin was furnished by an orange served for dessert. Children served at the end of the luncheon period were given food containing from 43.66 to 99.68 percent as much ascorbic acid as those served first."

[Ascorbic acid in apples] (*West Virginia Sta. Bul.* 317 (1944), pp. 16-17).—Apples grown in the university orchard at Morgantown and analyzed soon after picking contained from 6.9 to 20 mg. of ascorbic acid per 100 gm. of fruit. Red Duchess, among the varieties tested, ranked highest in ascorbic acid content, with the other varieties ranking in decreasing order as follows: Duchess, Grimes Golden, Stayman Winesap, Jonathan, Golden Delicious, Rome Beauty, Melba, York Imperial, Wealthy, Wagener, Maiden Blush, and McIntosh. It was found further that there was little or no loss of ascorbic acid as long as the apples remained on the tree, but that losses after picking were often considerable even in a short period, especially if the apples were stored at ordinary cellar temperatures. Rome Beauty (9.2 mg. ascorbic acid per 100 gm.) and York Imperial (8.4 mg. per 100 gm.) were the only varieties that did not lose the vitamin rather rapidly when stored at 36°-40° F. for 3-30 days.

Effect of various factors upon the ascorbic acid content of some Florida-grown mangos, M. J. MUSTARD and S. J. LYNCH (*Florida Sta. Bul.* 406 (1945), pp. 12, illus. 4).—Ascorbic acid was determined essentially by the method of Heinze et al. (E. S. R., 92, p. 310) on 25-gm. samples from individual fruits and consisting of two longitudinal sections, one taken from each side of the fruit. Preliminary sampling trials to determine the effect of the part sampled indicated that there was no significant difference in the longitudinal distribution of ascorbic acid in the fruit flesh, but that there was a decrease in the concentration of the vitamin with increased distance from the skin. In a study of maturity differences, tests were conducted with Haden mangos picked (1) at the ripe state, where the fruit had reached full color and had begun to soften, (2) at the stage where the color had just begun to break, and (3) at the stage, designated as green, where the fruit were of full size but showed no sign of breaking color. All samples were allowed to ripen to the stage of edible ripeness before being analyzed. The average ascorbic acid content at these three stages, respectively, was  $22.66 \pm 2.09$ ,  $19.66 \pm 0.44$ , and  $26.96 \pm 1.76$ . Although the fruit picked as the color was breaking (the stage recommended for commercial shipping) contained the least ascorbic acid, other desirable features, such as better keeping quality and superior flavor, more than compensated for the slightly lower vitamin content. Analysis of 30 varieties showed average ascorbic acid values to range from 9 to 72 mg. ascorbic acid per 100 gm. for most of the varieties; however, two varieties (No. 11 and White Langra) were exceptionally rich, averaging, respectively, 107 and 104 mg. per 100 gm. Haden mangos, fruits of commercial importance, averaged about 19 mg. per 100 gm. of fruit. Five Cecil mango seedlings of polyembryonic origin showed no significant differences in ascorbic acid content. The effect of environmental factors was studied in fruits of three varieties collected from the three principal mango-growing areas of southern Florida. In these tests, significant differences by region were observed for the Cambodiana and turpentine seedling varieties, but these differences may have been due in part to differences in the degree of maturity. No significant differences were found in the Hadens collected from the three areas. Fruits sprayed with Fermate for the control of anthracnose contained significantly more ascorbic acid than did those left unsprayed.

## TEXTILES AND CLOTHING

**Analysis of work shirts and overalls,** M. B. HAYS, L. S. JOINER, and D. C. CAUDILL. (U. S. D. A.). (*Jour. Home Econ.*, 37 (1945), No. 2, pp. 100-105).—Fifteen brands each of work shirts and overalls available to Farm Security Administration families were purchased to study garment construction and physical properties. The prices paid for these in the spring of 1943 ranged from \$0.79 to \$1.75 for size 16 shirts and from \$1.19 to \$2.45 for size 40-34 overalls. The simplified construction, such as fewer rows of stitching, pockets without flaps, and sleeves cut "off the grain," as shown in some of the garments, apparently reflected War Production Board limitation orders. Weight per square yard and warp and filling counts did not show much variation within each of these two groups of garments, but the strength of the materials, as determined by the grab method, and the resistance to abrasion varied widely. In general, the work garments contained relatively large amounts of nonfibrous material, showing that the fabrics in them were starch-finished during manufacture. Colorfastness to light (Fade-Ometer) and to laundering was generally good, as shown by laboratory tests, but these test procedures did not predict very well the colorfastness in actual service where the garments were observed to fade. The materials in 2 brands of shirts and 2 of overalls shrank considerably upon laundering. In some cases the fabrics showed low shrinkage values, but garment shrinkage measurements were somewhat higher, indicating that the fabrics had been stretched somewhat during garment manufacture. Shrinkage was not excessive, however, in most of the 30 brands of garments in the price range studied. "As a group, the chambray shirts were less resistant to abrasion than were those made from other types of fabric. The bib overalls and dungarees were more resistant than were any of the shirts. Also the twill weave pocket linings were more resistant to abrasion than were those of plain weave heavy muslin. From observations of garments after they were laundered, the buttons would soon need to be replaced on the shirts, but the overall fasteners and riveted buttons did not rust and probably would give satisfactory service. While laundering produced some reduction in breaking strength, the laundered fabrics retained sufficient strength so that their usefulness would not be unduly impaired."

## HOME MANAGEMENT AND EQUIPMENT

**Research in family life in Nebraska,** L. H. STOTT. (Nebr. Expt. Sta.). (*Jour. Home Econ.*, 37 (1945), No. 2, pp. 80-83).—This is a general discussion of the research program on family life at the Nebraska Station, initiated in September 1935 "to help evaluate the factors common to the rural home environment as they affect child development, and thus to provide some assistance to parents." The aspects studied and methods used are summarized briefly, and some of the findings, most of which have been noted from technical reports (E. S. R., 92, p. 133), are cited with their general implications. The role of the experiment stations in this type of research is discussed.

**Home management and family level of living,** D. DICKINS. (Miss. Expt. Sta.). (*Jour. Home Econ.*, 37 (1945), No. 1, pp. 13-18).—This discussion, limited to the family living on the small-scale farm and having minimum resources with which to meet farm-family needs, is based very largely on the results of a survey previously noted (E. S. R., 90, p. 718).

## REPORTS AND PROCEEDINGS

**Report of the Secretary of Agriculture, 1944,** C. R. WICKARD (U. S. Dept. Agr., Sec. Agr. Rpt., 1944, pp. 196+).—This report covers the activities of the

Department of Agriculture. Findings of the State experiment stations are also included.

Among the subjects discussed and not abstracted elsewhere in this issue are maintaining postwar demand and long-time farm needs; agricultural reconversion problems, including employment aspects, changes in the production pattern, price and foreign trade implications, possible exports, domestic consumption, adjustment for farm efficiency, and the need of world collaboration; agriculture and world finance, including foreign lending and lowering of barriers; world organization of agriculture, including world use of agricultural science, a proposed Food and Agriculture Organization of the United Nations, and gearing production to consumption; food conditions in continental Europe, the Soviet Union, the Far East, and Japan; cooperation with Canada and Latin America; price supports and prices after the war; handling food reserves; terminating wartime controls; operations of the Commodity Credit Corporation and the Agricultural Adjustment Agency; the upward trend in farm mechanization; marketing facilities in public works planning; improvement of cropland, pasture, and ranges; erosion control on farm lands; needs in postwar forest conservation; rural electrification; farmers' cooperative associations; utilization of synthetic ammonia plants; disposal of military lands; ownership of family farms; farming opportunities after the war; land settlement; the farm-land boom; hired labor in agriculture; postwar implication of wartime farm changes; peacetime tasks in marketing farm products; credit facilities for agriculture; farm income prospects; the year's production; cotton as a world problem; wheat during and after the war; wool and wool prices; achievements and difficulties in livestock production; poultry and eggs; tobacco; sugar; fruits and vegetables; fats and oils; the extension services in the war effort, including the recruiting of farm workers, food preservation in the home, crop improvement, animal husbandry programs, aids to fruit and vegetable growers, and rural youth and other extension jobs; crop insurance; the Farm Security program; the drain on our forests, and forest research; nutrition needs and aids in the United States and abroad; maintaining wartime nutrition gains, and how soil differences affect nutrition; achievements in plant science research; entomology in the war; and research aids animal industries and farm product uses and dairy product consumption.

Report of the Administrator of Agricultural Research, 1944, E. C. AUCHTER (*U. S. Dept. Agr., Agr. Res. Admin. Rpt., 1944, pp. 234+*).—This report includes the report of the Administrator, in which are notes on progress attained in plant breeding, insect control, penicillin and other aids to medical science, livestock research, new foods and better nutrition, and industrial uses for agricultural materials. Appended are reports, also issued as separates, of the Bureau of Agricultural and Industrial Chemistry (pp. 13-51), Entomology and Plant Quarantine (pp. 123-178), and Plant Industry, Soils, and Agricultural Engineering (pp. 191-222), all noted elsewhere in this issue, and those of the Bureaus of Animal Industry (pp. 53-100), Dairy Industry (pp. 101-122), and Human Nutrition and Home Economics (pp. 179-190), and the Office of Experiment Stations (pp. 223-234) noted previously (E. S. R., 92, p. 871).

Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1944, P. N. ANNAND (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1944, pp. 56; also in U. S. Dept. Agr., Agr. Res. Admin. Rpt., 1944, pp. 123-178*).—This report summarizes investigations of plant insects, including control of codling moth with DDT, xanthone, a dinitro-o-cresol spray, and nicotine sulfate, control of *Parlatoria chinensis* with oil emulsions, plum curculio on peach, oriental fruit moth parasites, shuckworms on pecans, cherry fruitflies, California red scale, milky disease and DDT for Japanese beetle, pear psylla suppression, Hall scale, and fruitflies; forest and shade tree insects, includ-

ing Englemann spruce beetle, pine bark beetle, spruce budworm, termites, and aerial application of DDT; cereal and forage insects, including development of insect-resistant cereals, alfalfa and sugarcane, corn earworm control, pea aphid and various sucking insects on alfalfa, grasshoppers, Mormon crickets, new compounds for control of insects attacking stored grains and milled cereals, and European corn borer and sugarcane borer studies; truck and garden insects, including new insecticides and control methods; cotton insects, including boll weevil, cotton aphids, pink bollworm, bollworm, plant bugs and stinkbugs, and effectiveness of DDT and chemical defoliation; bee culture, including pollination studies, insecticides v. bee losses, artificial insemination, and bee breeding; insects affecting man and animals, including new sprays and washes for ticks, moth-proofing fabrics, new treatments for screwworms and fleece worms, lice on livestock, and rotenone extenders in cattle grub control; foreign parasite introduction; control investigations with aerosols and sprays, tests of substitute materials; insecticide investigations; Mexican fruitfly, phony peach and peach mosaic disease, gypsy and browntail moths, Dutch elm disease, white pine blister rust, white-fringed beetle, chinch bugs, barberry eradication, sweetpotato weevil, mole crickets, pink bollworm, and dog fly control; and foreign plant quarantines.

**Report of the Chief of the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, 1944, R. M. SALTER (U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. Rpt., 1944, pp. 32; also in U. S. Dept. Agr., Agr. Res. Admin. Rpt., 1944, pp. 191-222).**—This report summarizes progress results of projects noted elsewhere in this issue and with the following: Mechanization of the peanut crop; rotenone production from *Tephrosia virginiana*; sagebrush control by mowing; cultural practices to prevent clover failures; pasture renovation; fertilizers for grasses; control of London plane disease; borax for an English walnut disorder; vitamin C losses in dehydrated vegetables; carbon dioxide as a control of watery soft rot of snap beans; effect of soil salinity on peaches; *Heterodera rostochiensis* as a new nematode pest of potatoes; DD for nematode control; rubber plant investigations; weed control; legume sod for sugar beets; tobacco culture; and bacterial wilt, root knot, and meadow nematodes as tobacco pests.

**Report of progress [of Maine Station] for year ending June 30, 1944, [F. GRIF-  
FER ET AL.]** (Partly coop. U. S. D. A.). (*Maine Sta. Bul.* 426 (1944), pp. 211-409+, illus. 1).—In addition to articles noted elsewhere in this issue and meteorological data, this report notes progress in studies of potato diseases and insects, including bacterial ring rot, leafroll and net necrosis, aphid biology and control, genetic resistance to insect injury and genetic variation as it influences the reproductive rate of plant lice, stem-end browning, late blight, purple top, and the foundation seed program; potato culture, including variety tests, fertilizer and green manure studies, and seed stock practices; potato products, including starch production; foods and nutrition, including appetite levels of food consumption; and basic foods and the nutrition of populations; fruits, including apple breeding and stocks, fertilization, orchard soil management, control of apple leaf scorch, McIntosh drop, insects (apple mealy bug (*Phenacoccus aceris*), European red mite (*Paratetranychus pilosus*), and apple fruit fly), apple scab control, and delayed orchard thinning; blueberry fruit fly; varieties of strawberries, raspberries, and grapes; canning and garden crops, including sweet corn breeding, seed treatment, fertilization, and the European corn borer, bean breeding, mosaic infection, germination, baldhead injury, and the Mexican bean beetle, seed treatment for peas and pea aphid control, tomato varieties and hybrid vigor, cucumber breeding for scab resistance, and varieties of various vegetables and their adaptability in northern Maine; a simple method for making a farm dairy cheese; dairying, including fertilizing pastures and

timothy hay, carotene losses in Ladino clover-timothy silage, and management conditions affecting the rate of growth of dairy heifers; poultry, including the effect of different methods of starting chicks on pasting, mortality, and growth, second-growth Ladino clover as a substitute for alfalfa leaf meal in poultry rations, length of incubation period in poultry as related to characteristics of progenies, and Maine-grown grasses and legumes as sources of vitamin A (carotene) for poultry and other farm animals; forestry, including markets for forest products in Maine, tree volume table and board feet per cord ratio tables, red pine sawfly (*Neodiprion n.* sp.), and northern white pine disease control.

**Research and farming:** *Sixty-sixth Annual Report [of North Carolina Station, 1943]*, L. D. BAVER. (Partly coop. U. S. D. A. et al.). (*North Carolina Sta Rpt. 1943, pp. 122, illus 68*).—In addition to data on social problems noted on page 89, this report deals with the progress of research in agricultural engineering, including the construction of a soybean thresher and cleaner, a new seed hopper and leveler, a heating jacket for tobacco curing, an electric dehydrator for home use, and sweetpotato drying and shredding; field crops, including hybrid corn, corn fertilizers and culture, and cotton fertilizers, cover crops, fiber quality, hormone requirements, seed protectants, and reginning; pastures and forage, including grazing and fertilizing Sudan grass, use of phosphates and lime, small grains, vetch, lespedeza, annual hays, borax for crimson clover and alfalfa, embryo development in Dallis grass, and black locusts and pasture; peanuts and soybeans, including combinations for sandy soils, calcium and potash for peanuts, seed treatments, varieties, and culture for peanuts and soybeans, cercospora leafspot fungi of peanuts, potash for soybeans, and bacterial diseases; small grains, including early seedlings, rates and fertilizers, adaptability of barley and wheat, cold-resistant oats, and chinch bug control; tobacco, including blue mold and flea beetle sprays, field control of hornworm, and resistance to Granville wilt and blackshank; truck crops, including lime and fertilizers for potatoes, varieties, control of potato flea beetles and leaf hoppers, soft rot and solar injury, dry beans, a new collard, tomatoes resistant to bacterial wilt, pickleworm control, soil treatments with sodium nitrite, nitrogen requirement of lettuce, seed treatment of lettuce, and vegetable preservation by brining; apples and peaches, including control of frog-eye leafspot of apple, storages for apples, control of root knot of peaches, peach tree borers, and white peach scale, and phosphorus need of peaches; small fruits, including strawberry varieties and fertilizer needs, and a new dewberry seedling; flowers and nursery, including sawdust mulch for azaleas and culture of Russian dandelion and guayule; beef cattle, including wintering on reed pasture, cottonseed hulls and protein concentrate, and forest range; dairy cattle, including vitamin A values of North Carolina butter, mastitis, and levels of limited rations for calves, and roughage for dairy cows; hogs, including use of dehydrated sweetpotatoes, ground wheat v. yellow corn, and plant proteins as supplements to corn; sheep, including control of internal parasites with phenothiazine-salt mixture; turkeys and poultry, including resistance to coccidiosis, livability of Leghorns, crossbreds v. purebreds, influence on egg production of lights, wet mash, and pellets, egg production in turkeys as influenced by age and broodiness, and carriers of pullorum disease; nutrition, including vitamin content of pork, beef muscle, sweetpotatoes, lespedeza, soybeans and cowpeas, and mountain pasture grass; soils, including losses from excessive row grades, erosion of coarse soils, and use of cover crops and rotations, need of borax, superphosphate injury, residual effect of fertilizers, and effect of pasture sods on soil productivity and of clay and calcium on cotton, soybeans, and peanuts.

**Utah Agricultural Experiment Station, Biennial Report, 1942-44,** R. H. WALKER. (Coop. U. S. D. A. et al.). (*Utah Sta. Bul. 315 (1944)*, pp. 44).—A brief summary is given of some of the more outstanding results, including those on

the fertilizing of pastures, fruit trees, sugar beets, and alfalfa; vegetable seed production; canal lining to conserve water; vitamin studies; weed control; chlorosis; control of leafhoppers and fruitworms on tomatoes; phosphorus as a preventive of parturient hemoglobinuria; time of marketing range cattle; and turkey production.

**Fifty-seventh Annual Report of the Vermont Agricultural Experiment Station, July 1, 1943-June 30, 1944.** H. R. VARNEY. (Partly coop. U. S. D. A. et al.). (*Vermont Sta. Bul. 520 (1944)*, pp. 35, illus. 4).—In addition to reports of activities noted elsewhere in this issue, the progress of work during the year is summarized on soils and fertilizers, including the effect of supplements on the saving of constituents of cattle manure, the effect of lime and organic matter on boron fixation and availability, and phosphorus fixation and unavailability; pasture and hay crops, including studies of turf, the influence of seed mixtures and fertilizers on pastures, the maintenance of permanent haylands, the conservation of nutrients in grasses and legumes, erosion control, and bird's-foot trefoil; cultivated crops, including potato scab, potato leafroll, fertilizers for field beans, silage corn, and *Taraxacum kok-saghs*, and variety tests with corn, soybeans, field beans, and oats; fruit, including biennial bearing, bitter pit, and varieties of apples, and strawberry varieties and culture; woodland crops, including tolerance of New England forest trees; dairying, including feed requirements of dairy animals, effects of prolonged colostrum feeding of dairy calves, and methods of detecting mastitis; farm management and agricultural economics, including the distribution of milk, land use since 1870, and farm labor efficiency; and genetic studies with violets.

**Farm science looks ahead:** [*Biennial Report of the West Virginia Station, 1943-44*], C. R. ORTON (*W'v'st Virginia Sta. Bul. 317 (1944)*, pp. 56, illus. 20).—In addition to results noted elsewhere in this issue, progress is reported of studies on farm crops and soils, including variety tests of wheat, barley, and soybeans, corn hybrids, fertilizers for rotations and corn, use of cover crops, pasture renovation, and lime to precede phosphorus; fruits and vegetables, including dwarf apples, nitrogen carriers for apples, cross cultivation of strawberries, cover crops for apple orchards, coloring apples with thiocyanate sprays, variety tests of potatoes, strawberries, currants, gooseberries, and raspberries, topping black raspberry primocanes, and cropping systems and rotations; beef cattle and sheep, including silages without preservatives from oat and hay crops, early lambing and creep feeding, stacked v. mow hay for lambs, relationship of avian leukosis and reproductive disorders, and phenothiazine and salt as anthelmintics; poultry husbandry, including soybean meal as a protein source, alfalfa leaf meal as a source of riboflavin, immature silages and hatchability, substitutes for bone meal, livability and production in White Leghorns, cracked grain and "pasting-up" in chicks, and crossbreeding to improve hatchability in turkeys; dairy cattle and dairying, including thyroprotein for dairy cows, relation of high milk production and mastitis, and off-flavors in milk; plant disease and insect control, including fixed-copper sprays for cherry diseases, organic sprays for apples, cause of apple measles, stripe smut of bluegrass, hot-water treatments for grain smuts, tip blight and thrips, relation of yeast spot of beans to the green stink bug, purple-top wilt of potatoes, and codling moth control; farm economics, including pasture fertilization, cost of milk production, and use of cutover land; and forestry, including renovation of barren lands, black walnut and grasses, and shrinkage of yellow poplar.

**Papers presented at annual meeting of Texas Agricultural Workers' Association** (*Tex. Agr. Workers' Assoc. Mtg., Papers, 1944*, pp. 75+, illus. 6).—Included are the following papers presented at the meeting at Fort Worth, Tex., January 11-12, 1944: Soil Conservation District Program, by V. C. Marshall (pp. 1-3); The Effects of Soil and Water Conservation on Increased Agricultural Production, by P. Walser (pp. 3-8); The Role of Certified Seed in Developing Texas Agricul-

ture, by R. V. Miller (pp. 9-13); The Present Threat of Pink Bollworm Invasion in Texas, by L. F. Curl (pp. 13-17); Notes on Post-war Housing, by H. G. Reynolds (pp. 18-23); Improving the Yield and Quality of Sweetpotatoes Through Breeding and Selection, by R. E. Wright (pp. 23-25); The Victory Garden in the Food Production Program, by J. F. Rosborough (pp. 26-27), and Solving Dairy Problems in 1944, by C. N. Shepardson (pp. 28-33) (both Tex. A. and M. Col.); Present Livestock and Meat Problems, by J. H. Hall (pp. 33-36); Wartime Swine Feeding, by F. Hale (pp. 37-39) (Tex. Expt. Sta.); The Sheep and Goat Industry of Texas, by V. Askew (pp. 39-42); War and Its Effect on Land Values, by S. Evans (pp. 43-47); War and Its Effect on Farm Products, by J. Shelton (pp. 47-48), and The War and Its Effect on Soil Conservation, by L. P. Merrill (pp. 48-50) (both U. S. D. A.); The Effect of the War on Farm Labor, by E. Butler (pp. 51-54); War and Its Effect on the Home, by M. A. Trickey (pp. 54-55) (U. S. D. A.); War and Its Effect on Agriculture—Summary, by A. L. Ward (pp. 56-58); 1944 Production Goals for Texas Agriculture, by B. F. Vance (pp. 59-62) (U. S. D. A.); The Farm Labor Situation in Texas, by C. Hohn (pp. 63-66), and The Farm Machinery Situation in Texas, by H. P. Smith (pp. 67-72) (both Tex. A. and M. Col.); and The State Farm Machinery Repair Program, by M. F. Thurmond (pp. 73-75).

## MISCELLANEOUS

Design and statistical analysis of some confounded factorial experiments, J. C. R. Lr. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul.* 333 (1944), pp. 449-492).—Confounded designs were constructed for 10 types of factorial experiment with the purpose of filling some of the gaps existing among plans previously available. Factorial combinations for which designs are given are:  $4 \times 2 \times 2$  in blocks of 4 or 8 plots,  $4 \times 4$  in blocks of 4 plots,  $4 \times 4 \times 3$  in blocks of 12 plots (2 designs),  $4 \times 4 \times 2$  in blocks of 8 or 16 plots,  $4 \times 2 \times 2 \times 2$  in blocks of 8 plots,  $5 \times 2 \times 2$  in blocks of 10 plots,  $3 \times 3 \times 2 \times 2$  in blocks of 12 plots,  $4 \times 3 \times 3$  in blocks of 12 plots,  $3 \times 3 \times 3 \times 2$  in blocks of 18 plots, and  $4 \times 3 \times 2$  in blocks of 12 plots. Reasons why a particular plan was adopted are discussed for each design; instructions for computing the sums of squares and for constructing summary tables of treatment means are given; and the extent of confounding is determined.

Mississippi Farm Research [January-February 1945] (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), Nos. 1, pp. 8, illus. 11; 2, pp. 8, illus. 3).—In addition to articles noted elsewhere in this issue and the monthly meteorological notes, these numbers contain the following:

No. 1.—Farm Prices Highest Since 1920, by D. G. Miley (pp. 1, 2); and Beef Calf Production in Mississippi, by R. H. Means, S. P. Crockett, and E. B. Ferris (pp. 3-7), also to be issued as a bulletin.

No. 2.—Crawfish Control in Prairie Area, by C. Lyle (p. 1); Byproduct Nitrate of Soda Satisfactory, by W. B. Andrews (p. 2); Tests of Corn Hybrids and Varieties in Mississippi, by R. C. Eckhardt et al. (pp. 3-6), also to be issued as a bulletin; and Nitrogen Side-Dressing for Cabbage, by E. L. Moore (p. 8).

Published information on foreign agriculture, January 1937 to December 1944 (*U. S. Dept. Agr., Off. Foreign Agr. Relat.*, 1945, pp. 34+).—The activities and publications of the Office are described, and its publications listed under the headings of regional, commodity, and other studies, and addresses.

## NOTES

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**California University and Station.**—*Science* notes that Dr. Harold E. Thomas, assistant professor of plant pathology and associate plant pathologist, has been appointed director of the Strawberry Institute, recently established by the industry to carry on research in strawberry breeding near San José.

**Idaho University.**—A gift to the university herd of nine Duroc purebred swine valued at at least \$3,000 has been made by W. E. Boeing of Seattle, Wash. This gift will materially enlarge and strengthen the university's Duroc herd of 25 purebred sows.

**Purdue University and Indiana Station.**—Dr. Norman Volk, head of the department of agronomy, has also been appointed assistant director of the station. Frank G. King has been succeeded by Claude Harper as head of the department of animal husbandry because of impaired health, but will continue as a member of the staff.

**Kentucky Station.**—Dr. Donald W. Chamberlain has been appointed assistant in forage crop investigations. Dr. Tasker P. Polk, office consultant in the department of animal pathology, died April 22.

**Michigan College and Station.**—Dr. E. A. Bessey, head of the department of botany and plant pathology, will relinquish administrative work on September 1, but will continue his research with the title of distinguished professor. Drs. Richard de Zeeuw, professor of botany, and H. T. Darlington, assistant professor, will retire during the summer. Dr. F. L. Wynd, assistant professor of botany at the University of Illinois, has been appointed professor of botany and chairman of the department. Dr. Eugene G. McKibben, head of the department of agricultural engineering, has resigned to accept a position with the Pineapple Research Institute of Hawaii to direct research in the engineering phases of pineapple production. Dr. G. J. Bouyoucos, research professor of soils, has been appointed to serve as agricultural consultant to the Government of Greece. Stanley Johnson, superintendent of the South Haven Substation, has been given the additional title of research professor of horticulture.

**Cornell University and Station.**—Dr. S. M. Johnson, extension instructor in milk marketing, has been appointed associate professor of agricultural economics in the Connecticut University and Storrs Station. Dr. E. V. Staker, assistant professor of soil technology, has been appointed agronomist in the State chemurgy project of the Nebraska Station.

Recent appointments include Dr. Leonard S. Cottrell, on leave for military service, as head of the department of rural sociology; Dr. M. B. Russell, research assistant professor of soils in the Iowa Station, as soil physicist; and Dr. H. H. Shepard as insect toxicologist vice Dr. R. T. Hansberry.

**North Carolina College and Station.**—According to *Extension Farm-News*, tests in growing Turkish tobacco are to be undertaken by Duke University in co-operation with about 25 farmers in the western part of the State. John S. Wilkins, for the past 10 years county agent in Cleveland County, has resigned to have charge of these tests. L. G. McLean, assistant horticulturist in the station and in charge of the nursery research program, has resigned to accept a commercial position in Massachusetts.

**North Dakota Station.**—The legislature has increased its appropriations to the main station for the biennium beginning July 1 from \$131,113.96 to \$244,159. The allotment for salaries, wages, and operations, including maintenance of scientific investigations, was increased from \$54,704.96 to \$130,000. Other items included \$11,000 for special equipment, \$45,159 for fixed charges, \$8,000 for land, \$6,500 additional for veterinary science, \$7,250 additional for improvements and repairs, and \$5,000 additional for public services. The fund for maintaining the existing substations was increased from \$46,750 to \$63,000, of which \$22,000 is allotted for the work at Williston, \$10,000 to Dickinson, \$12,000 to Hettinger, \$10,000 to Edgeley, and \$9,000 to Langdon. An additional section of land adjoining the substation at Dickinson has been purchased for \$40,000, and \$40,000 additional is provided for supplies and machinery.

Another branch station to be known as the North Central Station and Seed Farm has been established on 480 acres of land donated to the college by Ward County, 3½ miles south of Minot. G. N. Greiszler, extension soil conservationist, has been appointed superintendent of this branch station.

**West Virginia University and Station.**—Dr. Velmer B. Fish, assistant biochemist, has resigned to engage in commercial work. Dr. Collins Veatch, a senior agronomist in the Office of the Coordinator on Inter-American Affairs, has been appointed assistant professor of agronomy and assistant agronomist. Dr. Arthur R. Colmer has been appointed assistant bacteriologist.

**Wisconsin University.**—Cecelia F. Abry, assistant professor of textile chemistry since 1935, died at Vincennes, Ind., on February 24 at the age of 52 years. A graduate of Purdue University with the M. S. degree from the Iowa College, she came to Wisconsin in 1927 as a graduate assistant and became an instructor in 1928. She was the author of a laboratory manual of textile chemistry published in 1932.

**Wyoming University and Station.**—Dr. Sherman S. Wheeler, professor of animal production and animal husbandman, has been appointed chairman of the animal husbandry department in the Colorado College and Station, beginning July 1.

**Office of Experiment Stations.**—The Department of Agriculture Appropriation Act for the fiscal year ending June 30, 1946, signed by President Truman on May 5, enlarged the sum available to the States for research under the Bankhead-Jones Act from \$2,463,708 to \$2,663,708. An increase of \$5,000 was also granted under the provisions of the act extending the Adams and Purnell Acts to Alaska, making the total available to the Alaska Station \$42,500. Other appropriations for payments to the States, Hawaii, Alaska, and Puerto Rico, and for the administrative expenses of the Office itself were continued on the present basis.

**Third Inter-American Conference on Agriculture.**—This conference will be held at Caracas, Venezuela, on July 24, 1945, for a period of approximately 2 weeks. The primary objective of the discussions will be to survey the problems affecting agriculture in the postwar period. A series of technical bulletins is being prepared by Venezuelan authorities on agriculture and animal husbandry. The U. S. Department of Agriculture is cooperating in the preparation of documentary material as well as a bulletin of information on agriculture in the United States, which will be available for public distribution in Latin America after the conference.

# EXPERIMENT STATION RECORD

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## RECENT WORK IN AGRICULTURAL SCIENCE<sup>1</sup>

### AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Total and free amylase content of dormant cereals and related seeds, J. DAVIDSON. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 70 (1945), No. 6, pp. 175-200).—In dormant seeds of barley, wheat, rye, oats, corn, rice, buckwheat, soybeans, sorghums, and cowpeas, and also ordinary white flour, total and free amylase was determined.

Of the principal cereals, wheat showed the highest diastatic activity; rye was close to wheat, and barley was considered considerably below wheat; oats, corn, and rice showed very little diastatic activity. Soybeans showed a relatively high diastatic power; the buckwheat, cowpeas, and sorghums had a very low saccharifying power or none. Each of the four varieties of barley, wheat, and rye showed an amylase content variation consistent with respect both to total and to free amylase. The diastatic activity developed in barley, wheat, and rye with the addition of papain (that of the total amylase) was invariably higher than that developed without papain (the activity of the free amylase). Papain had no effect on the saccharifying power of soybeans nor on that of the seeds which had a low free amylase content. Ordinary white wheat flour showed a free diastatic power much lower, and a total diastatic power higher, than that of ground whole wheat. Baker's yeast and certain common unidentified microflora increased the diastatic power of ground whole wheat and flour but had little effect on that of rye and oats; baker's yeast decreased the diastatic power of barley but the microflora had little effect on it. Lactic acid increased the diastatic power of flour and ground wheat, but depressed that of barley. In wheat the pH shift was toward the optimum digestion of the wheat proteins; in the barley, it was away from that optimum. Sodium chloride increased the diastatic power of wheat and flour and decreased that of barley and rye. In flour the liberation of amylase was related to the concentration of the salt. Potassium iodate depressed the diastatic power of flour, the depression being correlated with the concentration of the iodate. Cysteine, like sodium chloride, stimulated the diastatic activity in flour, but decreased the loaf volume of bread whereas sodium chloride did not.

Flour was found to be rich in amylase and poor in active proteinases, and to be a good medium for testing the effect of proteinases and for the estimation of proteinases in other plant materials. By using flour as the testing material it was found

<sup>1</sup> The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

that the proteinase content in plant materials was not correlated with their amylase content. A number of examples of such findings are given.

The red pigment of leguminous root nodules, R. H. BURRIS and E. HAAS. (Univ. Wis. et al.). (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 227-229, illus. 1).—The red pigment of root nodules of cowpeas (*Vigna sinensis*) was purified by fractionation with 0.50- to 0.75-fold saturation with respect to ammonium sulfate, was dialyzed against water, and was dissolved in 0.05 M phosphate buffer of pH 7.1. The relative absorption spectrum of this solution was determined by photoelectric spectrophotometry, light absorption ( $\log I_0/I$ ) being plotted as a function of the wavelength. The absorption line in the blue region, characteristic for hemin compounds, was shown by this substance. The spectrum of the oxidized form exhibited only one band in the visible range at 530 m $\mu$ . After deoxygenation of the solution, the spectrum of the oxidized form remained unchanged, an observation indicating true oxidation and not mere oxygenation of the red pigment. Reduction by hydrosulfite was accompanied by a considerable change of the absorption spectrum. As with other hemin compounds, the band in the blue region of this pigment was shifted to a longer wavelength upon reduction. Reduction was followed by an unusual decrease in light absorption.

Respiration in the orange: A study of systems responsible for oxygen uptake, A. A. HUSSEIN. (Univ. Calif.) (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 201-211, illus. 6).—In measurements of oxygen uptake made on orange tissues by the Warburg technic, the flavedo showed the highest activity, with an optimum at about pH 5.0. The effect of inhibitors and numerous added substrates indicated that a system involving cytochrome oxidase is responsible for a major part of the oxygen uptake. The presence of cytochrome *b* was spectroscopically shown by the characteristic absorption band at 563 m $\mu$ . This was observed only after reduction with hydrosulfite, however. Of dehydrogenase activity as indicated by methylene blue reduction, about 30 percent appeared due to a relatively heat-stable system.

Inverse correlation between rubber hydrocarbon and a crystalline fraction isolated from latex of *Cryptostegia grandiflora*, W. S. STEWART and R. W. HUMMER. (U. S. D. A.). (*Bot. Gaz.*, 106 (1945), No. 3, pp. 333-340, illus. 3).

Studies on pituitary lactogenic hormone.—X, The effect of a detergent, C. H. LI. (Univ. Calif.). (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 45-48, illus. 1).—In this further study (E. S. R., 90, p. 292), the relative viscosity of lactogenic hormone solutions in the presence of urea and of a detergent was determined. The increase of viscosity and coincident lowering of biological activity of the hormone in detergent solutions was demonstrated.

On the mechanism of the conversion *in vivo* of methionine to cystine, V. DU VIGNEAUD, G. W. KILMER, J. R. RACHELE, and M. COHN. (Cornell Univ.). (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 645-651).—Methionine labeled with S<sup>35</sup> and with C<sup>14</sup> in the  $\beta$  and  $\gamma$  positions was fed to rats and the cystine was subsequently isolated from the hair. It was found from isotopic analysis of the cystine that approximately 80 percent of its sulfur but no significant amount of its carbon had been derived from the methionine. The carbon chain of methionine is not, therefore, utilized in the *vivo* conversion of methionine to cystine.

A study of the synthesis of  $\beta$ -alanine in the white rat, J. R. SCHENCK and V. DU VIGNEAUD. (Cornell Univ.). (*Jour. Biol. Chem.*, 153 (1944), No. 2, pp. 501-505, illus. 1).—It was shown that growing rats are able to synthesize  $\beta$ -alanine. Rats on a low pantothenic acid diet deposited more than 50 times as much  $\beta$ -alanine in their tissues as was supplied in the diet. The  $\beta$ -alanine content of the liver tissue reflected the amount of pantothenic acid supplied in the diet, but the  $\beta$ -alanine content of the extrahepatic tissues was independent of dietary  $\beta$ -alanine. The  $\beta$ -alanine content of the tissues was determined by a yeast growth method which is detailed.

A study of the acetylation in vivo of certain d-amino acids, F. BINKLEY, J. L. WOOD, and V. DU VIGNEAUD. (Cornell Univ.). (*Jour. Biol. Chem.*, 153 (1944), No. 2, pp. 495-500).—Phenyl-d- and benzyl-d-cysteines were converted in vivo for the most part to the corresponding N-acetyl-l-amino acids. Some direct acetylation also took place. The substitution of a bromine atom in the aromatic ring increased the extent of the direct acetylation. *p*-Bromobenzyl-d-homocysteine was completely inverted. No inversion of the l-amino acids or of the N-acetylbenzyl-d-cysteine was observed.

Amino acid analysis of some common vegetables: Method for carbohydrate-free extraction of nitrogen from fresh vegetables, A. A. ALBANESE, D. L. WAGNER, J. E. FRANKSTON, and V. IRBY (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 10, pp. 609-611, illus. 1).—"Fresh vegetables (0.5 to 1.0 kg.) were frozen, cut to suitable size, and immersed in acetone at room temperature for 48 hr., then submitted to a continuous acetone extraction for 24 hr. The two acetone fractions were combined, and the nitrogenous products washed out by this treatment were set aside for analysis after the removal of acetone, lipids, and plant pigments. The vegetable residues were further extracted by 24-hr. immersions in each of two 1.5 l. of hot 90-percent formic acid. These two fractions were combined and concentrated in vacuo to 1 l., and the carbohydrates were precipitated by the addition of 2 l. of 95-percent ethanol and removed by filtration. The filtrates, which contain the bulk of the nitrogen, were distilled in vacuo to remove the alcohol and formic acid. The combined acetone-soluble and formic acid-soluble residues were found suitable for bioassay or, on hydrolysis, for amino acid analyses, and contained 90-95 percent of the total nitrogen of the fresh products."

Data obtained on the solubility of various carbohydrate substances (cellulose, cornstarch, Lintner starch, dextrans, sucrose, dextrose, gum arabic, gum tragacanth, and other) in formic acid indicate that the dextrans and mucilages constitute the principal impurities in the formic acid extracts of the vegetables. Solubility differences between these carbohydrates and proteins (zein, gelatin, hemoglobin, lactalbumin, and casein) in a formic acid-ethanol mixture afforded an effective means of separation. This separation was effective with the vegetables studied (string beans, carrots, potatoes, turnips, white cabbage, Chinese cabbage, kale, spinach, and celery), but "it is wholly probable that in the study of other vegetable foodstuffs the carbohydrate-protein relationships may be such as not to be separable by this technic." Application of the formic acid-ethanol method to dried seed meals or pulverized dehydrated vegetables was unsatisfactory due to the formation of gels and the loss of dispersion of protein. The use of fillers such as Celite or filter paper did not completely overcome these difficulties. "It appears, therefore, that the adaptability of the method to other foodstuffs is limited by the particle size and physical characteristics of the product."

The determination of phenylalanine in proteins, W. L. BROWN. (Ga. Expt. Sta.). (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 277-282).—The presence of tryptophan in a mixture of amino acids or in a protein hydrolysate interfered in the determination of phenylalanine by nitration and color development by hydrolysis. When the tryptophan was removed by precipitation with mercuric sulfate solution before nitration, reliable results are reported to have been obtained. Phenylalanine determinations on eight protein preparations by the modified method are reported.

The direct determination of valine and leucine in fresh animal tissues, B. S. SCHWEIGERT, J. M. MCINTIRE, C. A. ELVERJEM, and F. M. STRONG. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 183-191, illus. 3).—Satisfactory standard curves for leucine and valine on a synthetic amino acid medium were obtained when *Lactobacillus arabinosus* was used as the test organism. Fresh muscle tissues could be hydrolyzed directly for leucine and valine analysis without pre-

liminary removal of fat, moisture, and water-soluble constituents. Satisfactory hydrolysis of animal tissues was obtained by autoclaving with 2 N HCl for 5-10 hr.

Fresh muscle tissues were found to contain an average of 0.93 percent valine and 1.4 percent leucine; muscle and organ tissue proteins, an average of 5.3 percent valine and 7.7 percent leucine.

A microbiological method for the determination of tryptophane, R. D. GREENE and A. BLACK (*Soc. Expt. Biol. and Med. Proc.*, 54 (1943), No. 3, pp. 322-324, illus. 1).—A brief description of the medium used, standard curve obtained, and specificity of response of *Lactobacillus arabinosus* 17-5 to *l*-tryptophan and related pure compounds, is given. The preparation of the sample to eliminate interfering substances is discussed. Either extraction is recommended to eliminate both indole and anthranilic acid, to which *L. arabinosus* gives a growth response.

A method for the quantitative microdetermination of glucose and maltose in mixtures, D. L. MORRIS (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 561-567).—The author has shown that glucose and maltose have different relative reducing powers when determined with different reagents. If the total reduction of a mixture of the two is determined with an alkaline copper and an alkaline ferricyanide reagent, it is possible to calculate the concentration of each in the mixture by the solution of a pair of simultaneous equations. Satisfactory results were obtained by this method. The maximum error was 0.03 mg. Causes of the additive errors making up this positive maximum total error are discussed in some detail.

Citric acid determination, A. S. GOLDBERG and A. R. BERNHEIM. (Cornell Univ. et al.). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 33-46, illus. 3).—The range of the method described is stated as that of from 1 to 40 mg., with a precision of 0.5 percent. With suitable care, even 0.2 percent was found attainable above 5 mg.

In the products of the "pentabromoacetone" reaction of citric acid, tetrabromoacetone and hexabromoacetone were also found. The principal conditions governing proportion of each bromoacetone formed were acidity, citrate concentration, and temperature. The decomposition of pentabromoacetone was effected by sodium sulfite at pH 7.6, a reagent which permitted a precise, direct titration with silver nitrate.

Determination of iron in food products, J. B. THOMPSON (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 10, pp. 646-648, illus. 1).—The modified method described involved wet ashing of the sample with concentrated nitric and sulfuric acids or with hydrogen peroxide and concentrated sulfuric acid (particularly advantageous for foods of high fat content), followed by final oxidation of iron with concentrated nitric and perchloric acids. After sufficient boiling to eliminate these two acids, the solution was diluted and adjusted to volume and the iron was determined by a modified thiocyanate procedure in which the color complex was extracted with isobutyl alcohol. Readings made on this extract directly in a spectrophotometer or photoelectric colorimeter were read against a standard curve plotted from readings on standards containing from 0-60 µg. iron and subjected to color development and extraction. The method proved entirely satisfactory when applied to a wide variety of food products, for which the data are reported and on which excellent recoveries were obtained. Three cooperating laboratories found the method satisfactory and applicable to such difficult problems as beer, with high phosphorus content, and spray-dried whole and skim milks of high calcium content.

Determination of vitamin A in dehydrated eggs, W. G. SCHRENK, D. S. CHAPIN, and R. M. CONRAD. (Kans. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 10, pp. 632-634, illus. 1).—The spectrophotometric method developed involved triple extraction of the sample with peroxide-free ether in a Waring Blender, carefully controlled evaporation of the extract under reduced pressure to a definite final volume, saponification of the residual extract with methanolic KOH, ether extraction of the vitamin A from the saponification mixture, and spectrophotometric estimation of the vitamin A in the washed dried ether extract,

optical densities being determined at 326 m $\mu$  for vitamin A and at 450 m $\mu$  for total yellow color. The procedure involved careful control of analytical conditions, particularly with respect to the evaporation and saponification times and conditions, since carotenoid-type pigments isomerize under the influence of heat, and the degree of isomerization affects the spectral absorption curves. Chromatographic studies of the pigments in the ether extract of the dehydrated eggs revealed that luteol and zeaxanthol accounted for more than 90 percent of the total pigments (luteol 63-76 percent, and zeaxanthol 32-20 percent); cryptoxanthol amounted to 3-5 percent, and the carotene to 2-4 percent of the total. A correction factor required because of the presence of luteol and zeaxanthol was determined by subjecting solutions of each of the pigments, and of a mixture in the approximate proportions in which they occur in eggs, to the entire analytical procedure. The results, which included the effect of isomerization of these pigments due to the procedure, showed that the true correction was about 15 percent of the absorption at 450 m $\mu$ . The absorption spectra of luteol and zeaxanthol in absolute ether and the specific absorption coefficients at their wave lengths of maximum and minimum absorption are presented. Results of bioassay and spectrophotometric analysis of dehydrated eggs agreed fairly well. Recoveries averaged slightly more than 90 percent. In a series of 120 samples under various treatments and storage conditions, values ranging from 13.6-6.3  $\mu$ g. per gram were obtained.

**Determination of vitamin A content of margarine:** Spectrophotometric method, R. H. NEAL and F. H. LUCKMANN (*Indus. and Engin. Chem., Analys. Ed.*, 16 (1944), No. 6, pp. 358-362, illus. 1).—The spectrophotometric method developed for the determination of vitamin A in margarine is based on the destruction of vitamin A in a portion of a solution of the unsaponifiable fraction of margarine fat by ultraviolet irradiation, and the use of this devitaminized solution as a control for the spectrophotometric determination of vitamin A in a second portion of the original unsaponifiable solution not irradiated with ultraviolet light. Consistent and reproducible results and practically complete recovery of the vitamin A were obtained by this method. Two solvents, namely, cyclohexane and methyl cyclohexane of specified brand were found to be satisfactory for the determination; two spectrophotometers, one an Adam Hilger and the other a Beckman instrument, each of specified model, were also found to be satisfactory. The validity of the method was demonstrated by comparison with the U. S. P. biological method on identical samples, by feeding both the sample under test and the U. S. P. standard of reference oil at multiple levels and estimating the biological vitamin A potency from log-dose interpolation curves.

**Some observations on the photochemical destruction of carotene,** L. P. PEPKOWITZ. (R. I. Expt. Sta.). (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 219-225, illus. 1).—The author has shown that oxygen is required, though only in traces, for the photolysis of carotene in the presence of chlorophyll. No mass action effect is produced as the concentration of oxygen is increased. Kinetic studies indicate that the reaction is of the first order with respect to chlorophyll and of zero order with respect to carotene. The rate-determining step at constant light intensity probably involves the photoreactivity of chlorophyll to produce an acceptor peroxide (carotene peroxide) which results in the destruction of carotene through autoxidation.

Methylene blue and eosin also induced the photochemical destruction of carotene. Methylene blue was more effective than chlorophyll and eosin less effective. Fluorescein had no effect. The uranyl ion supplied as uranyl acetate was extremely active as a photolytic agent at a mole ratio of uranyl to carotene of approximately 50 : 1. Below this ratio the rate dropped off rapidly, and above this ratio the rate decreased more slowly.

**Riboflavin requirements of certain lactic acid bacteria,** T. E. CAMPBELL and G. J. HUCKER. (N. Y. State Expt. Sta.). (*Food Res.*, 9 (1944), No. 3, pp. 197-205,

*illus. 7).*—A large number of strains belonging to the genus *Lactobacillus* and a few strains belonging to the genera *Leuconostoc* and *Streptococcus* were investigated by an assay method essentially the same as that described by Snell and Strong (E. S. R., 82, p. 587). All inoculations and incubations were carried out in a darkened room and cultures were incubated at 37° or 30° C., dependent upon the optimum growth conditions of the various groups. Standard series of the riboflavin medium were set up and inoculated with washed cells grown originally in a broth medium containing 100 µg. of riboflavin per liter. The amount of growth in response to the various levels of riboflavin was determined by titration using two drops of 1-percent bromothymol blue as indicator. The results, presented as graphs showing the acid production with respect to the amount of riboflavin per 10 cc. of medium, indicated that the lactic acid organisms could be grouped as follows "(1) Organisms failing to grow in the basal medium both with and without riboflavin; (2) organisms failing to grow in the basal medium alone and growing only very slightly when riboflavin is added; (3) organisms failing to grow in the basal medium but producing moderate to large amounts of acid with the addition of riboflavin; and (4) organisms growing in the basal medium and showing no increase in acid production with the addition of riboflavin."

One culture of *Lactobacillus* was found which responded to smaller amounts of riboflavin than the present assay organism *L. casei*. Comparative studies of the two organisms indicated that this particular *Lactobacillus* could be successfully used for assaying materials too low in riboflavin to be accurately assayed with the *L. casei* culture, e. g., in the range of 0.01 to 0.10 µg. per 5 cc.

Determining ascorbic acid in large numbers of plant samples, E. H. LUCAS. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 10, pp 649-652, *illus. 2*).—The method developed involved the grinding of the material in a specially devised grinding machine as an alternate to the Waring Blender, filtration rather than centrifugation of the sample, and titration in an unbuffered metaphosphoric acid solution (1-3 percent) with a rather concentrated solution of 2,6-dichlorophenolindophenol. The procedure enabled the author and three student assistants to make as many as 500 ascorbic acid analyses per day. The grinding device, permitting the disintegration of 10 samples within 2-6 min. and employing 2-gm. samples fine quartz sand and 3 cc. of 20-percent metaphosphoric acid (diluted to 2 percent before titration), gave results comparable to those obtained with the Waring Blender employing 10 to > 100-gm. samples and 100 cc. of 2-percent metaphosphoric acid. The machine grinding was more satisfactory than the extraction with the Waring Blender for seeds and very fibrous tissue (gladiolus leaves), and both of these processes gave higher yields than hand grinding. In 500 tests made with various plant materials, filtered and centrifuged extracts gave very similar values, but the former method offered a greater saving in time, requiring only 3 min. to yield enough extract for the titration, while the latter required 15 min. to bring the centrifuged sample to that point. Ascorbic acid values of fresh plant materials compared quite favorably whether made by the titration procedure of Mindlin and Butler (E. S. R., 80, p. 728), the colorimetric procedure of Bessey (E. S. R., 82, p. 14), or the modification of Morell (E. S. R., 87, p. 15). In some instances a significant difference appeared to exist between the results obtained, but higher results were obtained in approximately as many cases with one method as with the other. To determine the effect of different concentrations of unbuffered acid during the titration, plant extracts prepared with 1, 2, 3, 5, or 10 percent metaphosphoric acid, or 5 percent sulfuric acid plus 2 percent metaphosphoric acid, or 0.4 percent oxalic acid, and solutions of ascorbic acid in these acids were titrated. The results showed some fading of the dye with 5 and 10 percent phosphoric acid, and pronounced fading with the sulfuric-metaphosphoric acid mixture, although the interference was not the same with all plant materials.

It appeared, however, that titrations could be accomplished safely and reliably with unbuffered solutions employing 1-3 percent metaphosphoric acid. Preliminary tests showed that the 2-percent phosphoric acid solution and the dye solution remained usable for 30 days and 2 weeks, respectively, if stored in the refrigerator at 0°-5° C.

A rapid test for detection of spoilage in sea fish, W. J. DYER, G. J. SIGURDSSON, and A. J. WOON (*Food Res.*, 9 (1944), No. 3, pp. 183-187, illus. 1).—Changes in surface pH of cod fillets or freshly killed codfish were found to correlate with organoleptic changes occurring progressively in the fish held until spoilage occurred. Surface pH obtained by direct electrode contact (using the Beckman pH meter with glass electrode) was the same, within experimental error, as that of a 3-mm. surface sample removed and dispersed in an equivalent weight of water. The rise in surface pH of fish fillets stored at 5° C. for 6 days was more rapid than the rise observed in the interior of the flesh, cut to permit direct electrode contact, and also more rapid than that observed in composite samples of surface and interior flesh dispersed in water. The increase in pH with aging, particularly at the surface where bacterial concentration was greatest, was associated with the development of tyrosine and trimethylamine (a relatively strong base) as spoiling progressed. Ease and rapidity of application, adaptation to commercial use, and correlation with other spoilage tests recommended the surface determination of pH by direct electrode contact as a practical routine method for the determination of the index of spoilage of sea fish. Fresh sea fish were found to have a surface pH range of 6.2 to 6.8; pH levels above 6.8 were indicative of spoilage; and the higher the pH above 6.8 the more extensive the spoilage changes.

Experimental work on cucumber fermentation.—XIII, Influence of garlic on the softening of genuine kosher dill pickles, F. W. WENZEL, JR., and F. W. FABIAN (*Michigan Sta. Tech. Bul.* 199 (1945), pp. 32).—The spoilage of dill pickles of this type is caused by the enzymatic break-down of the pectic materials in the middle lamella of the cell walls of the pickles. Garlic is an indirect potential cause of the spoilage of these pickles, in that the use of garlic contaminated with molds and bacteria probably results in the introduction of hydrolytic enzymes which cause the softening. Garlic free from microbiological contamination will not cause pickle softening. The spoilage in question can be greatly reduced by avoiding the use of any garlic which shows evidence of mold or bacteria or by using blanched or sterilized garlic, dehydrated garlic powder, or garlic vinegar.

Genuine kosher dill pickles should be used within 6, and preferably 4 mo. after storage. Because of their low salt and acid content, they are very susceptible to spoilage, irrespective of the type of garlic used in their manufacture. Under the most favorable circumstances, there was usually a 5- to 10-percent loss at the end of 21 weeks.

This bulletin continues a series previously noted (*E. S. R.*, 79, p. 299).

Heating lag in thermal death-time cans and tubes, P. SOGNEFEST and H. A. BENJAMIN (*Food. Res.*, 9 (1944), No. 3, pp. 234-243, illus. 4).—This paper reports work on heat penetration in thermal death time cans and tubes, the equipment (illustrated) and procedure employed being described in some detail. Terms and nomenclature used are consistent with those used in the earlier heat penetration studies cited. In the present work "it has been demonstrated that when making thermal death time tests involving relatively short times, the heat-penetration lag and the retort come-up time take up an appreciable percentage of the total thermal death time. Correction factors for these lags have been determined for a number of products. When the factors are used in correction of come-up and heat-penetration lags in thermal death time studies, lower *F* and *s* values are obtained than when instantaneous heating and cooling is assumed without applying the corrections."

## AGRICULTURAL METEOROLOGY

**Meteorology: A practical course in weather**, G. J. BRANDS (*New York and London: McGraw-Hill Book Co., 1944, pp. 235+, illus. 73*).

**Clouds as indicators of weather conditions**, L. F. MILLER. (*Univ. Minn. (Minn. Acad. Sci. Proc., 11 (1943), p. 63)*.—An abstract.

**The elements rage**, F. W. LANE (*London: Country Life, Ltd., 1945, pp. 188+, illus. 47*).—This is a popular account of the violent manifestations of nature—hurricanes, tornadoes, waterspouts, hail, snow, lightning, meteorites, earthquakes, and volcanoes. An eight-page bibliography and an index complete the volume.

**Causes of nighttime thunderstorms over the Middle West**, D. M. CROWLEY (*Jour. Aeronaut. Sci., 11 (1944), No. 4, pp. 313-318, illus. 17*).—The author describes this type of summer thunderstorm, which is initiated and maintained by instability-producing conditions other than cold fronts, warm fronts, or thermal instability. Local superadiabatic instability initiates nighttime thunderstorms, and this instability is produced by any one of the following: Advection of warm air or cooler air at intermediate and high levels and advection of warmer air at intermediate levels and cooler air at higher levels. Several typical occasions when these conditions prevailed and produced thunderstorms are described and analyzed.

[**The New England hurricanes**] (*Jour. New England Water Works Assoc., 59 (1945), No. 1, pp. 9-21, illus. 3*).—These pages include Hurricanes, With Special Emphasis on the New England Hurricane of 1938 and 1944, by L. T. Rodgers (pp. 9-12); Effect of the Hurricane of 1944 on Massachusetts Water Supplies, by F. H. Kingsbury (pp. 13-18); and Effect of the Hurricane of 1944 on Rhode Island Water Supplies, by W. J. Shea (pp. 19-21).

**On the 27.0074-day cycle in Washington precipitation**, C. G. ABBOT (*Smithson. Misc. Collect., 104 (1945), No. 9, pp. 2+*).—The author computed for the year 1944 the actual average precipitation per day of the "preferred" days and of the others for each month and for the year, showing that for the year the preferred days gave 1.48 times as much average precipitation per day as the others; the expected ratio—noted in a previous paper (*E. S. R., 92, p. 617*)—was given as 1.42. The preferred dates when greater average precipitation is expected to occur than on the remaining dates are also tabulated for the year 1945.

**La meteorología aplicada al estudio de la vegetación: Aspecto integral y parcial del problema [Meteorology applied to the study of vegetation: General and special aspects of the problem]**, J. M. BERGERO (*Rev. Met. [Montevideo], 1 (1942), No. 4, pp. 62-86, illus. 7*).

**Some climatic aspects of tree growth in Alaska**, J. L. GIDDINGS, JR. (*Tree-Ring Bul., 9 (1943), No. 4, pp. 26-32, illus. 3*).—Certain facts and conclusions as to the climatic meaning of Alaskan ring records are briefly summarized as a report of progress pending future research. The collection of tree-ring material (1942) reported upon was confined to a 3 weeks' trip down the Yukon River and a plane flight to McGrath on the Kuskokwim River (map included). Cross-dating is presumably best within a zone of critical temperature of the growing season. The ring record loses its pure temperature significance as it leaves the timber line, and timber line appears to be limited by the mean temperature of the growing season. Radial growth in timber line trees is largely completed during 4-6 weeks centered about July 1; hence June-July temperatures closely represent the temperature of the growing season. Curves of timber-line tree growth closely approximate the curve of mean June-July temperatures for the same general area. June-July temperature seems best recorded in trees growing in the 50°-55° F. mean July temperature zone. The next zone—55°-60°—includes the greater part of central Alaska. The 60°+ zone includes the Yukon Flats with its highly sensitive Series B Dating, which apparently

records something other than direct temperature response; this chronology perhaps represents some combination of spring snowfall, rainfall, and temperature of the growing season. This record seems to be influenced largely by climatic factors outside the immediate growing season, while the growth fluctuations of timber line trees are related closely to climatic stresses active during the period of greatest cell formation. The transition zone of tree-ring response is analogous in position to the other zones. It would seem that while zones of equal temperature are likely to be zones of cross-dating, it is the relaxing or degree of relaxation of the temperature stress that controls the amount by which tree growth can be affected by some other specific climatic stress.

Preliminary report on substratum temperature studies on root growth, S. W. OEXEMANN (*Minn. Acad. Sci. Proc.*, 11 (1943), pp. 40-44, illus. 2).

Influence des cultures irriguées sur le climat [The influence of irrigated crop-lands on climate], R. LAMOUR (*Fruits et Primeurs Afrique Nord; Rev. Franc. Oranger*, 11 (1941), No. 116, pp. 124-125, illus. 1).

Comparison of climate of the United States and Europe, with special attention to Poland and her Baltic coast, W. GORCZYŃSKI (New York: Polish Inst. Arts and Sci. in Amer., 1945, pp. 288, illus. 36).—As stated in the foreword by E. C. Paradis, "the monograph is devoted to the comparative description of the sunshine climate alone and represents a first and timely welcome comprehensive summary of differences in temperature, cloud cover, sunshine duration, and solar radiation on two large continents . . . ." In a final chapter the author develops briefly his decimal scheme of world climates and points out that southern Florida and certain parts of California and Mexico are blessed with the best type of climate, comparable with that in Mediterranean lands, South America, South Africa, Asia, and Australia. The subdividing of the best type of climate into the three kinds, Mediterranean, Floridian, and Intertropical Mountains and Highlands, is said by Paradis to be a new idea, presenting a fruitful suggestion to students of climatology, human ecology, geography, and specialists in actino- and climatherapy.

[Climatology parallels in the United States and Europe], M. Y. NUTTONSON ([Washington, D. C.]: *United Nations Relief and Rehabil. Admin.*, 1944, Dec., pp. 2+, illus. 1; 1945, Jan., pp. [5], illus. 1; Jan., pp. 3+, illus. 1; Mar., pp. 4+, illus. 4).—These processed reports, dealing, respectively, with the climatology of Yugoslavia, Greece, Albania, and Czechoslovakia and their climate parallels in the United States, present the results of a series of studies arising out of the problems of crops and climate which the liberated areas of the world face in their agricultural reconstruction, due to the destruction and deterioration of seed stocks. The emergency nature of this plant introduction task precludes the extensive employment of the usual procedure of field-trial plantings; the problem was therefore approached through the climatic characteristics of the various regions under study, viz., a close comparative study of the agroclimatic conditions of the regions under investigation with those of the United States in order to determine the "climatic analogs." It is hoped that use of these data—here presented through maps, tabulations, and discussion—will offer a fairly good chance of success for the crops transferred from an American area to its "opposite number" in countries of the Old World.

Report on the phenological observations in the British Isles from December 1943 to November 1944, H. C. GUNTON (*Roy. Met. Soc. [London], Quart. Jour.*, 71 (1945), Sup., pp. 31, illus. 3).—Another report (E. S. R., 91, p. 253).

## SOILS—FERTILIZERS

Soil aggregation as a factor in yields following alfalfa, H. E. and H. G. MYERS. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 12, pp. 965-969, illus.

1).—Aggregate analyses are reported for soil samples taken at successive intervals after plowing down of alfalfa and sweetclover in rotations of legume 2 yr., row crop, oats, wheat, and at corresponding times in a rotation of row crop, oats, wheat. Approximately 50 percent higher total aggregation was found in samples taken before row crop and before oats from the legume rotations than those taken from the nonlegume rotations. Differences in aggregation were not significant in samples removed from the wheat plots either in early spring or after harvest. This apparent break-down of water-stable aggregates in the legume rotations coincides with small grain yields in these rotations. The legume rotations have increased oat yields an average of 6.7 bu. over the nonlegume rotation yields, but have increased wheat yields only 1.1 bu. The authors conclude that the favorable effects of the legume upon subsequent small grain yields under these conditions may be largely through its effect on soil structure rather than from its influence on soil nitrogen.

The influence of soil reaction on rotation grass in south-west Scotland, R. LAIRD (*Jour. Ecol.*, 32 (1945), No. 2, pp. 193-203).—The author describes an instance of the marked influence of lime—where arable crop yields were suffering seriously—on the yield of hay and the botanical composition of the sward on intensively cropped land, as well as its influence on the grass seeds sown 14 yr. later. The effect of lime on the sward of another farm where the lime deficiency was less acute and the limited effect of the composition of the seed mixture on its botanical analysis are also described. The effects of acid and basic manures on the composition of the sward during the cropping rotation—with and without lime—are given in full for typical southwestern Scotland dairy farms. How the rotation cropping and manuring can be made a good preparation for pasture afterwards is indicated.

Plant growth relations on saline and alkali soils, O. C. MAGISTAD. (U. S. D. A.). (*Bot. Rev.*, 11 (1945), No. 4, pp. 181-230).—This comprehensive review (362 references) considers the formation, classification, and composition of saline and alkali soils and the plant relations thereto. In saline soils the principal factor depressing plant growth is the decrease in available water due to the high osmotic pressure of the soil solution. Some investigators attribute decreased growth therein to the harmful effects of specific ions; such effects are known, but in most cases they appear less important than the inhibition from high osmotic pressure. Many reasons are listed why a reduction in water intake decreases plant growth. Many alkali soils are waterlogged, with low  $O_2$  contents in the soil air; this lack of  $O_2$  is believed also to reduce plant growth. Plants growing in saline soils are subjected not only to high concentrations of certain salts, but also to salts not in the most favorable ratios for growth, thus interfering with normal assimilation. In alkali soils having large contents of Na, the soil takes on unfavorable physical properties; a number of authors ascribe the untoward effects of alkali soils to a break-down of the Ca regime in addition to these poor physical conditions. Such soils also usually have high pH values, with attendant unavailability of several of the essential elements. In alkali soils of low salt content some  $Na_2CO_3$  is present; the alkali carbonates are very toxic and even corrosive to plants. Soil solutions of high osmotic pressures are not confined to the saline soils of the western United States, but may occur also as a result of heavy applications of soluble fertilizer, especially in sandy soils. A distinction is made between the characteristics of saline and alkali soils, since it is believed that the physiological reactions of the plant differ under the two sets of conditions; it follows that a plant may be tolerant to one soil type and not to the other.

Growth curves of *Azotobacter* at different pH levels, P. L. GAINES and E. FOWLER. (Kans. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 70 (1945), No. 7, pp. 219-236, illus. 11).—A study of more than 40 pure cultures of *Azotobacter* led to the conclusion that the  $H^+$  concentration of the medium exercises a profound influence, either directly or indirectly, upon the growth (reproduction) of this organism.

The maximum H<sup>+</sup> concentration compatible with growth varied somewhat with different strains but in general fell within the range pH 5.5 to 6.0. Growth was markedly retarded within a few tenths pH unit of the critical H<sup>+</sup> concentration. The presence of fixed nitrogen did not alter the critical H<sup>+</sup> concentration for any strain studied. Increase in size of the individual cell and metabolism of fixed nitrogen and energy substrate could continue at H<sup>+</sup> concentrations inhibitory to cell division. In a liquid medium culture of *Azotobacter*, during the period of active cell division, changes in turbidity, cell volume, energy substrate, and (in the presence of ammonium sulfate) ammonium nitrogen and H<sup>+</sup> concentration paralleled changes in cell numbers. In the absence of active cell division, however, any one or all of these activities may undergo radical alteration independent of growth.

Note on the ability of certain strains of *Rhizobium* from peas and clover to infect each other's host plants, J. KLECKOWSKA and P. S. NUTMAN (*Jour. Bact.*, 48 (1944), No. 6, pp. 673-675).—The ability of certain strains of *Rhizobium* from clover to produce nodules on peas and of strains from peas to infect red clover was confirmed by independent cross-inoculation tests made at Glasgow, Scotland, and Rothamsted, England. Strains were cross-inoculated two or three times and, after reisolation, were found to agree in serological behavior with the original cultures. Formation of nodules on the cross-inoculations, however, took place only to a limited extent, and, in the case of pea strains on clover, after a long interval. In no case did the host plant derive visible benefit from the strain belonging to the other inoculation group. The fact that only certain strains will cross-inoculate may explain the disagreement in the findings of other workers.

Effects of *Rhizobium meliloti* bacteriophage on alfalfa, S. C. VANDECAYEVE and C. D. MOODIE (Wash. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 241-247, illus. 1).—Four yr. of pot culture investigations with the irrigated soils of the Yakima Valley containing a potent *R. meliloti* bacteriophage are reported on the effect of phage-resistant and phage-susceptible cultures of *R. meliloti* on bacterial-wilt-resistant and wilt-susceptible varieties of alfalfa. Alfalfa variety characteristics did not appear to have any effect upon the potency of *R. meliloti* phage activity in the soil obtained from samples of soil from plots having 5-year-old stands of common, Grimm, Ladak, and Hardistan alfalfa. Phage from soils caused complete lysis of a 24-hr. fluid culture of phage-susceptible *R. meliloti* in less than 48 hours' incubation in contact with the second serial transfer of the phage filtrates isolated from the soils. During the first year of the experiment the potency of the phage in the soil used for the pot cultures declined to the extent that three or four serial transfers of the phage filtrates were required to accomplish complete lysis of the phage-susceptible *R. meliloti* culture.

No significant effect on the potency of phage activity was ever manifested as a result of soil treatments with various fertilizer materials, soil inoculation with phage-resistant and phage-susceptible cultures of *R. meliloti*, or potent *R. meliloti* phage filtrates, or as a result of plant properties possessed by different varieties of alfalfa. Increased potency of phage activity was manifested in the soil when the alfalfa was in its fourth year of growth. At the same time, visible symptoms of bacterial wilt and nematode infestation appeared and became more pronounced as the season advanced. Additions of nitrogen fertilizers to the soil for the second and third crops of the 4-year-old alfalfa resulted in an increase of approximately 50 percent in yields of the three varieties of alfalfa grown. The diseased plants did not derive any marked benefit from the nitrogen fertilizer and, therefore, the increase in yield was due largely to the improved vigor and growth of the nondiseased plants. It was evident that symbiotic nitrogen fixation by the 4-year-old alfalfa was inadequate for normal growth. Results obtained from soil inoculations with different cultures of *R. meliloti* and with *R. meliloti* phage suggest that different phages with varying degrees of potency exist, and that certain yet unknown soil properties

influence phage activity. It was shown further that under certain conditions prevailing in irrigated soils in the Yakima Valley phage activity may be the direct cause of greatly diminished symbiotic nitrogen fixation and yields of 3- and 4-year-old alfalfa.

The comparative effects of a 50—50 mixture of 1 : 3 dichloropropene and 1 : 2 dichloropropane (D-D mixture) and of chloropicrin on nitrification in soil and on the growth of the pineapple plant, R. K. TAM. (Univ. Hawaii). (*Soil Sci.*, 59 (1945), No. 3, pp. 191—205, illus. 3).—A comparative study was made of the effects of the soil disinfectants D-D mixture and chloropicrin on biological nitrification in the soil and its subsequent effects on ammonium and nitrate absorption, root development, rate and quality of growth, and total elaboration of organic matter by the pineapple plant. Since plants with the largest root systems made no more growth than those with the smallest on nearly similar nitrate nutrition, it was considered that the amount of top growth and total N absorption were related to the ammonium supply in the soil and hence to the suppression of nitrification by the disinfectants. Under the experimental conditions, 200 lb. D-D suppressed nitrification for 8 weeks and 200 lb. chloropicrin for at least 24 weeks; 400 lb. D-D was more effective than 200 lb. D-D, but not so efficient as 200 lb. chloropicrin. In all cases, leaf nitrate correlated with the amount of nitrate found in the soil.

The total amount of N absorbed at the completion of 35 weeks' growth was lowest in the check treatment, which was on a high-nitrate nutrition. An appreciable increase in absorbed N was found in the 200-lb. D-D treatment, which was on a partial nitrate and ammonium nutrition. The highest amounts of total N were in the plants on a nearly complete ammonium nutrition, viz., 400-lb. D-D and 200- or 400-lb. chloropicrin treatments. Plants in the check and in the 200-lb. D-D treatment which were supplied with appreciable amounts of nitrate during growth were slower-growing, yellower, higher in percentage of dry matter, and lower in total dry matter and absorbed smaller amounts of available soil N than plants on the other treatments. Plants growing in soil treated with 400 lb. D-D, 200 lb. chloropicrin, and 400 lb. chloropicrin were restricted to ammonium as a N source and characterized as a high-N, dark-green, fast-growing, broad-leaved, soft, and succulent type. Although no nematode galls were formed on the root systems of plants in any of the treatments, examinations for non-gall-forming nematodes indicated D-D to be a more efficient nematicide than chloropicrin. It is suggested that delayed response of pineapple plants to D-D may be related to the improved root systems at maturity from control of root pathogens by the disinfectant. Use of sufficiently high concentrations of D-D to inhibit nitrification in the soil will be evidenced by early response resulting in the typical ammonium plants seen after chloropicrin treatment of the soil.

Nodulation modifies nutrient intake from colloidal clay by soybeans, H. E. HAMPTON and W. A. ALBRECHT. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 234—237).—The effect of the composition of the root on the ionic exchange between the colloidal complex of the soil and the root is considered in this paper. Soybeans were grown in two different sets, each with two amounts of calcium, and each calcium level in combination with three different amounts of potassium. Nodulated crops with their more proteinaceous roots represent these as different physicochemical systems, when tested against the colloidal clay of the soil, from the roots of nonnodulated soybeans. When the concentrations and totals in the crops of the originally adsorbed ions on the clay are considered, the nodulated crop demonstrated more regularities and consistent relations between those within and those outside the crop roots.

While the nonnodulated crop masses were larger, the nodulated crops were higher in concentrations and totals of potassium, in concentrations of calcium, of magnesium,

and of phosphorus, but lower in totals of the nonnutritive silicon. In terms of the ingo of exchangeable ions from the clay, higher percentages of the potassium and magnesium were taken on consequence of nodulation. Calcium and phosphorus in total moved into the nonnodulated crop as readily as into the nodulated crop. The workers suggest that the composition of the legume forage, in terms of several of the mineral nutrient elements from the soil, is different because the protein nature of the root makes this part of the plant a different physicochemical system in relation to the colloidal complex of the soil for their intake. Plant nutrition as a movement of adsorbed ions from the clay into the root is not only a matter of kinds and amounts of ions on the clay and of the total clay in the soil, but also a matter of the physiology of the particular root as well.

Proceedings of the nineteenth annual meeting of the National Joint Committee on Fertilizer Application, including reports of cooperators, held at Cincinnati, Ohio, November 9, 1943 (*Natl. Joint Com. Fert. Appl. Proc.*, 19 (1943), pp. 190+, illus. 10).—The following papers were presented: Distribution of Various Types of Ammonium Nitrate—Preliminary Report, by G. A. Cummings, L. G. Schoenleber, and C. W. Whittaker (pp. 7-11) (U. S. D. A.); The Influence of Placement on the Efficiency of Different Calcium Phosphates in Greenhouse Experiments (Preliminary Report), by D. G. Coe, R. P. Bartholomew, G. W. Volk, and C. W. Whittaker (pp. 12-17) (U. S. D. A. and Ark. and Ala. Expt. Stas.); The Distribution of Nitrogen Materials in Irrigation Water, by H. D. Chapman (pp. 18-23) (Univ. Calif.); The Distribution of Nitrogen Fertilizers in Solution, by F. W. Parker (pp. 23-27) (U. S. D. A.); Principles Determining Where Fertilizer Should Be Placed for Greatest Efficiency, by R. W. Cummings (pp. 27-32) (N. C. Sta.); Scope of Fertilizer-Placement Research, 1943, by G. A. Cummings (pp. 33-44); Summary of Fertilizer Placement Experiments in the Northeastern Region, by C. B. Sayre (pp. 45-48) (N. Y. State Sta.); Report on Fertilizer Placement Studies in the Western Region, by S. C. Vandecaveye (pp. 49-51) (Wash. State Col.); and Report of the Special Committee on Fundamental Problems (pp. 52-54).

The following reports of cooperators are included: Placement of Fertilizer for Tobacco, by T. R. Swanback and P. J. Anderson (pp. 55-57) (Conn. [New Haven] Sta.); Progress Report on the Development of a Once-Over, One Mule, Fertilizer Distributor and Seed Planter, by G. W. Giles and E. R. Collins (pp. 57-58) (N. C. Sta.); Fertilizer Demonstrations of Corn and Hemp, by C. J. Chapman (pp. 58-61) (Univ. Wis.); Fertilizer Placement Experiments on Tobacco, by O. E. Street (pp. 62-63) (U. S. D. A. coop. Pa. Sta.); Fertilizer Placement Tests, by F. S. Prince (p. 64) (N. H. Sta.); The Effect of Machine Placed Fertilizer on Yields of Transplanted Yellow Bermuda Onions, by L. R. Hawthorn (pp. 64-67) (Tex. Sta.); Fertilizer Placement Experiments in Eastern Virginia, 1943, by M. M. Parker, R. L. Carolus, G. A. Cummings, L. G. Schoenleber, and W. C. Hulbert (pp. 68-71) (Va. Truck Sta. and U. S. D. A.); The Effect of Fertilizer Placement on Yield of Cannery Spinach and Swiss Chard, 1943, by K. Baur, N. Dickson, G. A. Cummings, and D. B. Eldredge (pp. 72-73), and The Effect of Fertilizer Placement on Seed Yields of Spinach and Table Beets, 1943, by K. Baur, G. A. Cummings, and D. B. Eldredge (pp. 74-76) (West. Wash. Sta. and U. S. D. A.); Fertilizer Placement and Starter Solution Experiments on Vegetable Crops, by M. L. Odland, W. B. Mack, E. M. Rahn, and C. B. Link (pp. 77-81) (Pa. State Col.); The Effect of Fertilizer, Plowed Under and in the Row, on the Yield and Stand of Soybeans at the Michigan Experiment Station in 1943 (p. 82), The Effect of Fertilizer Placement on Yield of Cannery Peas at the Michigan Experiment Station in 1943 (pp. 83-84), and The Effect of Fertilizer, Plowed Under and in the Row, on the Yield and Stand of Sugar Beets at the Michigan Experiment Station in 1943 (pp. 84-85), by C. E. Millar, R. L. Cook, and J. F. Davis (all Mich. State Col.); Results of Fertilizer

Placement Experiments in 1943, by C. B. Sayre (pp. 85-93) (N. Y. State Sta.); Fertilizer Placement Experiments on Peas, Tomatoes, and Sweet Corn in Maryland, by C. H. Mahoney, H. A. Hunter, G. A. Cumings, L. C. Schoenleber, and W. C. Hulbert (pp. 94-99) (Md. Sta. and U. S. D. A.); Comparisons of Fertilizer Placed in the Plow Furrow, in the Hill, and With a Drilled Sweet Corn Crop Used for Green Manure on the Growth and Yield of Sweet Corn (pp. 100-102), The Effect of Fertilizers Applied in the Furrow and in the Hill on the Growth and Yield of Sweet Corn (pp. 103-106), and Fertilizer Placement and Inoculation Experiments With Peas (pp. 106-110), all by G. R. Muhr and J. Dawson; Band Placement Versus Broadcast Application of Superphosphate and Ammonium Phosphate on Lettuce in the Yuma Valley, by A. E. Griffiths (pp. 111-115) (Univ. Ariz.); Experiments With Deep Application of Large Amounts of Fertilizer in Indiana, 1943 (pp. 115-123) (Ind. Sta.); Cooperative Fertilizer Studies in Illinois, 1943, by C. J. Badger, F. C. Bauer, C. H. Farnham, P. E. Johnson, A. L. Lang, and L. B. Miller (pp. 124-133) (Univ. Ill.); Fertilizer Placement for Corn—A Progress Report, by R. E. Yoder, J. D. Sayre, J. T. McClure, and J. H. Wilson (pp. 134-138), and Rates and Placement of Nitrogen for Corn Following Timothy (pp. 139-140) and Fertilizer Placement for Corn—Outlying Farms, 1943 (pp. 141-143), both by R. E. Yoder (all Ohio Sta.); Fertilizer Placement Test with Potatoes—Maine, 1943, by J. A. Chucka, A. Hawkins, and B. E. Brown (pp. 144-145) (Maine Sta. coop. U. S. D. A.); Fall Versus Spring Application of Nitrogen to Millet in Maine, 1943, by J. A. Chucka and A. Hawkins (p. 146) (Maine Sta.); Fertilizer Application Tests on Potatoes, 1943 (Five Tests in Pennsylvania) (pp. 147-148), and 1943 Fertilizer Application Test on Sweet Potatoes, Caroline County, Virginia (p. 148), both by S. D. Gray; Relation of Fertilizer Placement, Rate of Application, Source of Nitrogen and Potassium, Irrigation, and Distance of Spacing Seed to Yields of Potatoes, by O. Smith, W. C. Kelly, and R. F. Hommel (pp. 149-154) (Cornell Univ.); Demonstrations on Plowing Down Fertilizer, Summary 1943, Pennsylvania, by J. M. Huffington (pp. 154-156) (Pa. State Col. et al.); Fertilizer Placement Experiments in Pennsylvania in 1943, by F. G. Merkle and E. C. Dunkle (pp. 157-161) (Pa. Sta.); Fertilizer Placement Studies for Alfalfa, by A. R. Midgley (p. 162) (Univ. Vt.); Fertilizer Placement Studies (pp. 163-164) and Some Fertilizer Application Results in New Jersey in 1943 (pp. 165-170), both by V. A. Tiedjens, Method of Application of Fertilizer for Corn, by F. E. Bear (p. 171), and Fertilizer Placement Tests on Potatoes in 1943, by J. C. Campbell (pp. 171-174) (all N. J. Stas.); The Effect of Adding Various Amounts of Potash at Various Times to Tomatoes on Some New Jersey Soils in 1943, by F. A. Shelton (p. 175); Fertilizer Placement Test on Corn, 1943, by C. E. Phillips and E. N. Carvel (p. 176) (Del. Sta. et al.); Fertilizer Placement Experiment on Peanuts, by E. T. Batten (p. 177) (Va. Sta.); Fertilizer Placement Experiments on Vegetables and Field Corn, by E. K. Walrath and O. H. Pearson (pp. 178-183); and Plowing Down Fertilizers for Corn, by E. H. Tyner (p. 184), and Response to Nitrogen and Potash Fertilizers in Rotations With and Without Lime, 1943, by T. C. McIlvaine and G. G. Pohlmeyer (p. 185) (both W. Va. Sta.).

The effect of nitrogen upon the response of cotton and oats to phosphorus, R. COLEMAN. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 12, pp. 970-975, illus. 1).—Greenhouse or field experiments were conducted with oats and cotton on Paden silt loam, Ruston sandy loam, Atwood sandy loam, and Grenada silt loam to determine the effect of nitrogen level of the soil on crop response. There was a definite relationship between the amount of nitrogen available to cotton and oats and their response to phosphorus. Cotton and oats gave only a slight response to phosphorus which was applied with small amounts of nitrogen, but both crops gave a high response to phosphorus which was applied with large amounts of nitrogen. Plants receiving adequate amounts of nitrogen not only respond better to

phosphorus but they also require larger amounts of it. These results partially explain why many crops do not respond better to phosphorus on southern soils which are low in this element, and they suggest that as long as nitrogen remains a limiting element in these soils nonlegumes will not respond well to phosphate fertilizer.

**Explosibility and fire hazard of ammonium nitrate fertilizer,** R. O. E. DAVIS (*U. S. Dept. Agr. Cir. 719 (1945)*, pp. 22).—Ammonium nitrate can be used as a high explosive, but a high-velocity detonator in sufficient quantity to energize the mass of material is required. Under favorable conditions of pressure, rapid heating, and retention of heat, it may be exploded partially from heat alone near 300° C., but no instance of explosion of the salt in ordinary containers or in bulk when involved in large conflagrations was found. Explosion by impact or friction is difficult and requires conditions obtained by design. Sensitivity is decreased by the presence of alkalies and alkaline earths and is increased by the presence of acid, as nitric acid formed in decomposition of ammonium nitrate at a moderately low temperature.

Ammonium nitrate-ammonium sulfate mixture in 50-50 proportion gave negative results in falling-weight, friction, and detonation tests, as was true also of mixtures with other ammonium salts and with superphosphate. Explosibility was decreased by the presence of inert, nonoxidizable materials. An explosion tended not to be propagated throughout the mass unless energized from without. Thermal decomposition beginning below 100° being endothermic, it was found that not until the temperature of the decomposing salt reaches about 260°-350° does the reaction become sufficiently exothermic to produce heat in excess of that absorbed by adjacent quantities of decomposing salt. Below this, the explosive wave was not propagated. Large grains or spherical granules tended to decrease the explosibility of ammonium nitrate, like that of other explosives. Ammonium nitrate is considered not explosive under transportation conditions or when stored in wooden receptacles or paper bags by itself and apart from other explosive substances.

With respect to fire hazard, ammonium nitrate was found much the same as sodium nitrate. Results of various experiments supporting this conclusion are given. Under conditions occurring in some mixtures, however, ammonium nitrate was found capable of decomposing, below 100° C., into ammonia and nitric acid, a reaction leading to a fire hazard greater than those associated with the sodium salt. For example, mixtures containing superphosphate, ammonium nitrate, and organic meal may give rise to spontaneous combustion from oxidizing reactions that sometimes begin at ordinary room temperatures. Ignition takes place when the temperature reaches 90° to 95°. Neutralization with ammonia removes this hazard, however.

**The vertical distribution of available (exchangeable) potassium in Oahu soils,** A. S. AYRES and C. K. FUJIMOTO. (*Hawaii Expt. Sta.*) (*Hawaii Planters' Rec. [Hawaii Sugar Planters' Sta.]*, 48 (1944), No. 4, pp. 249-269, illus. 31).—The level of potassium was found in some soils to decrease with depth to the bottom of the section examined. In other soils, the level decreased with depth for a distance of 1.5-2 ft, but with greater depth rose again. It was found that analysis of the surface layer of soil gives only a very incomplete picture of the quantities of potassium available to such crops as sugarcane.

## AGRICULTURAL BOTANY

**Recherches sur la croissance des cultures bactériennes [Researches on the growth of bacterial cultures],** J. MONOD (*Paris: Hermann & Co., 1942*, pp. 210+, illus. 65).—The text of part 1 concerns the growth phases of bacteria, methods of culture and measurement, the yield and rate of growth as functions of the concentration of the media, yields in the course of growth and as a function of the growth

rate, temperature in relation to growth, and the analytical expression of growth. In part 2 the author considers the phenomenon of diauxy, its nature and mechanism. A bibliography of 11 pages is included.

**Morphological characteristics of a purified thermophilic cellulose-decomposing [bacterial] culture**, D. B. PRATT. (Purdue Univ.). (*Jour. Bact.*, 49 (1945), No. 2, p. 205).—An abstract.

**Oxidation of butyric acid by streptococci**, C. F. NIVEN, JR., J. B. EVANS, and J. C. WHITE. (Cornell Univ.). (*Jour. Bact.*, 49 (1945), No. 1, p. 105).—Butyric acid was oxidized by streptococci of group F, by the "minute" variety of group G, and by many strains of *Streptococcus mitis*. Pneumococci and other species of streptococci did not appear to possess this property.

**The pantothenic acid requirements of lactic acid bacteria**, V. H. CHELDELIN, E. H. HOAG, and H. P. SARETT. (Oreg. State Col.). (*Jour. Bact.*, 49 (1945), No. 1, pp. 41-45).—Pantothenic acid was found to be a growth determinant for 33 strains of lactic acid bacteria; the  $\beta$ -alanine and lactone moieties of pantothenic acid were not utilized by these organisms. Several producing large amounts of lactic acid on a relatively simple medium appeared well suited for assaying pantothenic acid. Growth and acid production were compared on four media. Optimum response of most species was obtained in the presence of added pantothenic acid by supplementing a simple growth medium with extracts of peptone and yeast which were free of pantothenic acid. Addition of other B vitamins to this medium was employed in studying the other requirements of some species.

**A serological study of strains of Alcaligenes radiobacter and Phytomonas tumefaciens in the "M" and "S" phases**, M. F. COLEMAN and J. J. REED. (Pa. Expt. Sta.). (*Jour. Bact.*, 49 (1945), No. 2, pp. 187-192).—Using the agglutination and agglutinin absorption technics employed in the study of typical strains in the Dawson M and S phases, the authors found that in the strains studied *A. radiobacter* and *P. tumefaciens* differ serologically in the M phase. The same strains were antigenically identical in the S phase, as indicated by complete reciprocal agglutinin absorption.

**New developments in the application of the germicidal lamp in industrial bacteriology**, L. J. BUTTOLPH (*Jour. Bact.*, 49 (1945), No. 2, p. 203).—An abstract.

**Estudio del bacteriófago de Rhizobium meliloti en suelos de México [Study of the bacteriophage of *R. meliloti* in Mexican soils]**, C. CASAS CAMPILLO (*Fitófilo*, 3 (1944), No. 5, pp. 3-46, illus. 2).—This investigation concerns the isolation and determination of the legume nodule bacteria *R. meliloti* and *R. phaseoli*, the culture media used and culture studies of the strains isolated, differences between *Alcaligenes radiobacter* and *Rhizobium* in culture, isolation and characterization of the phage of *R. meliloti* and its distribution in Mexican soils and relation to soil texture and pH, properties of the phage isolated—heterogeneity and virulence, behavior of *R. phaseoli*, *R. trifolii*, and *R. japonicum* in the presence of the phage of *R. meliloti*—lysoresistance, and the semiquantitative determination of the phage of *R. meliloti* in the soil.

**Microbiological aspects of penicillin, VII, VIII** (*Jour. Bact.*, 49 (1945), No. 1, pp. 7-20).—In continuation (E. S. R., 90, p. 523), the following papers are included:

VII. **Bacterial penicillinase**, H. B. Woodruff and J. W. Foster (pp. 7-17).—The ability to destroy penicillin is reported to be a widespread property among bacteria, yeasts, and fungi, with aerobic spore-forming bacteria and certain actinomycetes being outstanding in this respect. Certain chemical and biological properties of extracellular penicillinase are described, together with experiments relating to its formation by bacteria.

VIII. **Penicillin from different fungi**, J. W. Foster and E. O. Karow (pp. 19-29).—It is concluded that the antibacterial substances found in culture filtrates of

*Aspergillus niger* YW, *A. nidulans*, *A. oryzae* TP, *A. flavipes*, and *Penicillium citreo-roseum* are either identical with or closely related to authentic penicillin produced by *P. notatum*. This was demonstrated by the solubility properties, thermostability, pH stability, antibacterial spectra against 18 different bacteria, destruction by penicillinase, and in one instance by efficacy in protecting animals against lethal bacterial infection. Strains superior in penicillin-producing ability to the parent culture of *A. oryzae* TP were isolated. The latter grew and produced penicillin best at 37° C.; with other fungi the optimum was 25°. *A. nidulans* grew at 37° but produced no penicillin; *P. notatum*, *A. niger*, and *P. citreo-roseum* failed to grow at 37°. In the tests made, kojic acid was more effective in inhibiting gram-negative than gram-positive bacteria.

The development of penicillin production, G. R. RETTEW (*Jour. Bact.*, 49 (1945), No. 2, p. 201).—An abstract.

Antibacterial substances produced by moulds, VI, VII (*Austral. Jour. Expt. Biol. and Med. Sci.*, 22 (1944), No. 4, pp. 223-226, 227-230).

VI. The production of crystalline penicidin, N. Atkinson, R. A. W. Sheppard, N. F. Stanley, and P. Melvin.—In a further study (E. S. R., 91, p. 19) of the ability of certain Australian strains of *Penicillium* to produce penicidin it was found to be readily lost but was restored in some cases by various culture procedures. Penicidin was actively antiluminescent, and titration of this property was used for estimating the activity of crude and partially purified preparations. The isolation of crystalline penicidin is described.

VII. The activity of a further group of Australian strains of *Penicillium* and *Aspergillus*, N. Atkinson, R. A. W. Sheppard, N. F. Stanley, and K. M. Rainsford.—Under the conditions of investigation of 50 Australian strains of *Penicillium* and 2 of *Aspergillus*, 15 of the former and both of the latter exhibited antibacterial activity. Either penicillin or penicidin was demonstrated in metabolism solutions from strains of *Penicillium* submitted to test. All active strains were derived from spontaneously occurring molds from a large variety of sources.

Antibacterial substances from plants collected in Indiana, D. SANDERS, P. W. WEATHERWAX, and L. S. McCLEUNG (*Jour. Bact.*, 49 (1945), No. 2, p. 206).—An abstract.

The Boletineae of Florida with notes on extralimital species.—I. The Strobilomycetaceae, R. SINGER (*Farlowia*, 2 (1945), No. 1, pp. 97-141, illus. 10).—The present contribution is intended to be the first of a series of monographic studies devoted to the basidiomycetous flora of Florida. Keys to the families, sections, genera, and species of the fungus group here considered and much new taxonomy are included.

The Gasteromycetes of Australia and New Zealand, G. H. CUNNINGHAM (*Dunedin, N. Z.: John McIndoe*, 1942, pp. 236+, illus. 339).—The results of some 20 years' study of this group of fungi in Australia and New Zealand are presented in this book, which aims at providing as complete a record as possible of the genera and species of these regions. The subject matter includes the economic importance of the group as foods, dyes, medicines, mycorrhizas, and as the causes of disease in plants; spore dispersal; cytological and developmental studies; phylogeny; distribution of the genera and species; classification—with keys to the genera and species; and the systematics of the group, which takes up the main body of the work and includes keys to the species. A nine-page bibliography, a glossary, and a subject index are provided.

Review of the Acrochaetium-Rhodochorton complex of the red algae, G. F. PAPENFUSS (*Calif. Univ. Pubs. Bot.*, 18 (1945), No. 14, pp. 299-334).—An annotated list of species, including a large number of new taxonomic combinations, following a general discussion of the group. There are five pages of references.

**Wild flowers and plants of Utah**, G. K. HEINECKE ([n. p.]: *Author*, 1943, pp. 75+, illus. 47).—In this semipopular manual each plant formation characterizing the Intermountain and Great Basin floras is described, and the effects of temperature, climate, soil, rainfall, etc., which control or affect plant growth are discussed. As far as possible, the plants are listed according to the habitats in which they are found, and descriptions, blooming times, and interesting facts concerning them are given.

**A study of phytosociological relationships by means of aggregations of colored cards**, W. T. PENFOUND (*Ecology*, 26 (1945), No. 1, pp. 38-57, illus. 2).—This study is concerned with the effects of changes in quadrat size, number of plant species, and total cover on the sampled frequency, density, and cover of species by means of an analysis of aggregations of colored cards. The analyses made by this technic led to the following conclusions: Frequency percentages, the frequency relation among species, and the number of species in the frequency classes of C. Ramkiae all vary with quadrat size, number of species, and total plant cover. Density does not vary with quadrat size, but changes with number of species and degree of cover; the density relation among species does not vary with quadrat size, number of species, or total plant cover. Actual cover per species does not vary with quadrat size, although it shifts with number of species or total plant cover; the cover relation among species is unaffected by quadrat size, number of species, or total plant cover. Of the three concepts, frequency is the most artificial and least important; cover is the most valuable, being unaffected by quadrat size and delineating relative dominance better than frequency or density. Size of quadrat cannot be predetermined if frequency, density, and cover are to be studied; quadrat size is relatively unimportant if frequency is omitted, since size of quadrat does not affect density or cover relations. The number of quadrats to be utilized as a sample depends on the quadrat size employed. Minimum area by quadrats is unaffected by size of quadrats, provided equal sample areas are employed, but it is modified both by number of species and by total plant cover. Since the author's data were not particularly reliable until he had sampled 85, 60, and 40 of the 2 X, 4 X, and 8 X quadrat sizes, respectively, they suggest a relatively large number of quadrats, at least 10 times the "break in the species-area curve," as a proper quantitative sample in community analysis.

**Some quantitative relations of foliage in the chaparral**, J. KITTREDGE. (Univ. Calif.). (*Ecology*, 26 (1945), No. 1, pp. 70-73, illus. 2).—For applying the results of laboratory or greenhouse determinations per unit of leaf weight or area to large plants or to all plants on an area of land, some method of estimating the amount of foliage less tedious than stripping and counting or measuring or weighing all the leaves becomes essential. Lacking such a method, the estimation of transpiration use of water by all plants in a drainage basin is an example of an application which has rarely been attempted. The weights and areas of leaves were found to be highly correlated and the weight per unit area nearly constant for a species. For two of the evergreen broad-leaved shrubs of the chaparral, the dry-leaf weight of individual plants or communities were estimated from the diameters of the crown according to a formula presented. For ceanothus at least, and probably also for other species, the total leaf weight per unit of area is a linear function of the percentage coverage of the crowns. It is believed that reasonably close estimates of the weight of all the foliage on areas of land can be greatly facilitated by applying these relations to measurements or estimates of crown diameters or percentage coverage.

**Production of unidentified vitamins by a strain of *Mycobacterium tuberculosis* grown on synthetic medium with p-aminobenzoic acid**, R. C. MILLS, G. M. BRIGGS, JR., T. D. LUCKEY, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 56 (1944), No. 2, pp. 240-242).—Culture filtrates of a

strain of *M. tuberculosis* grown on a synthetic medium containing high concentrations of *p*-aminobenzoic acid were found to contain considerable amounts of the unidentified vitamins ( $B_m$  and  $B_{II}$ ) which promote growth and feathering in chicks. This synthesis was definitely stimulated by the acid.

**Recherches sur l'action des substances mitoclasiques.—I, Action de la colchicine sur les racines d'Allium cepa** [Researches on the action of mitoclastic substances.—I, Action of colchicine on roots of the onion], G. MANGENOT (*Paris: Hermann & Co., 1942, pp. 120, illus. 70*).—In the three parts of this memoir are presented, respectively, the technics used in the study, the observations and experiments carried out, and a general consideration of the results.

**The utilization of  $\beta$ -alanine and pantothenic acid by yeasts**, H. P. SARETT and V. H. CHEDELIN. (Oreg. State Col.). (*Jour. Bact.*, 49 (1945), No. 1, pp 31-39).—A comparison was made of the 18-hr. growth of 16 strains of *Saccharomyces cerevisiae* and 1 of *S. carlsbergensis* on a synthetic medium with various levels of the above substances, these yeasts being found to differ in sensitivity. Some of them failed to attain as much growth with excess  $\beta$ -alanine as with excess pantothenic acid; addition of yeast extract increased the growth above that obtained with excess pantothenic acid in all cases. The response to  $\beta$ -alanine was not affected by the presence of an excess of the lactone of the pantothenic acid molecule, and only one yeast had its growth inhibited with  $\beta$ -alanine by large amounts of taurine or pantoyltaurine; the latter inhibited the utilization of pantothenic acid for growth by all the yeasts. Utilization of small amounts of  $\beta$ -alanine was inhibited by asparagine. For the Gebrüder Mayer yeast, growth in the presence of small amounts of  $\beta$ -alanine was inhibited by amino acids, hydrolyzed casein, and norit-treated beef, liver, and yeast extracts. The response to large amounts of  $\beta$ -alanine and all levels of pantothenic acid was either not affected or was stimulated by these same substances. The limitations of the use of yeasts for measurement of  $\beta$ -alanine are discussed. A method for quantitative separation of pantothenic acid and  $\beta$ -alanine is presented.

**The influence of heteroauxin on cell growth and root development**, H. BURSTRÖM (*Lantbr. Högsk. Ann. [Uppsala]*, 10 (1942), pp. 209-240, illus. 8).—Heteroauxin was found to retard cell elongation in wheat roots at all concentrations tested down to  $10^{-11}$  moles per liter; this retardation ceased after a few days, however, and was followed at low concentrations by a stimulatory effect. The retardation decreased cell length to about 20 percent of its normal value; the stimulation increased it up to 50 percent above normal. In the presence of heteroauxin the cell-wall elasticity increased before and during the first phase of growth; this phase was stimulated irrespective of whether the cells later became retarded. The retardation was due to a more or less complete inhibition of the second growth phase which normally implies the deposition of cellulose in the wall. The recovery in part involved an adaptation of the cells to higher auxin concentrations. The retarded cells exhibited a higher wall tension and an increased osmotic value over normal cells; this caused a radial stretching of the cells, which contributed to the swelling of the roots in the auxin. Another cause was the changed direction of cell division; its rate was not affected. Mature cortical cells supplied with heteroauxin became hypertrophied. This growth did not appear to differ from the initial phase of normal growth, though the cells were incapable of further development. The hypertrophy may also be promoted by an increased sugar supply; in several respects heteroauxin and sugar had the same effects on cells, and a hypothetical explanation is given. During retardation, heteroauxin changed the carbohydrate metabolism only insignificantly, yet it must be connected with a hindrance of the cellulose deposition in the walls. A sketch of cell growth is drawn, with due allowance for the differing action of heteroauxin on the first and second phases of elongation. There are about two pages of references.

Il bilancio idrico delle piante [The water balance of plants], L. MONTEMARTINI (*Genova (Genoa): Soc. Anonima Editrice D. Alighieri, 1943, pp. 62+, illus. 11.*].—On the physics and physiology of water relations in plants.

Die osmotischen Verhältnisse während des Streckungswachstums der Wurzel [The osmotic relations during root elongation], H. BURSTRÖM (*Lantbr. Högsk. Ann. [Uppsala], 10 (1942), pp. 1-30, illus. 10.*).—This study is concerned with the osmotic force and elasticity of the cell walls during normal elongation of the epidermis in wheat roots. The suction force of the epidermis during the most active stretching is nil, the turgor pressure equaling the osmotic pressure. Growth falls into two phases: The first precedes an increase in the elasticity of the cell wall; only after that does elongation begin. In the first phase the cell stretching proceeds slowly, the elasticity increasing and finally attaining a maximum value. In the second phase the stretching is accelerated and the elasticity progressively decreases. The turgor pressure during stretching depends on the nutrient supply. In the more poorly nourished roots the osmotic value decreases in the first phase, in normally fed roots it is constant during the whole growth period, and with excess sugar it attains a maximum in the zone of elongation. In the last case the elongation period is prolonged until finally the osmotic value has decreased to normal. With increase in temperature the maximum elasticity mounts and its rate of increase rises. Growth is accelerated, but the final cell length, on account of the shortened elongation period, is less. Schematically, the result is that in the first phase the extensibility of the wall and in the second phase the supply of osmotic substances are the limiting factors. In the second phase the elastic extensibility in absolute mass per cell is constant. The conception of a "plastic overextensibility through turgor pressure" in the sense of going beyond the elasticity limit is criticized, and its inapplicability, at least to the water-saturated epidermal cells, is verified. The cells do not grow uniformly, but more rapidly in certain places. Furthermore, the elasticity within an individual cell may be unevenly distributed. It is shown that these phenomena are connected with a division of the root into zones of faster and slower growth; these extend beyond the cell limits. In view of these findings, the relative independence of the cell wall system from the protoplasts is discussed. There are 19 references.

The growth of roots as influenced by pH and salt content of the medium: A contribution to the theory of growth, H. LUNDEGÅRDH (*Lantbr. Högsk. Ann. [Uppsala], 10 (1942), pp. 31-55, illus. 8.*).—The elongation of wheat roots in solutions of different pH and salt content was measured photographically at intervals of 0, 3, and 6 hr. and the distribution of the electrical potential (PD) over the different zones of the tip was measured by an amplifier and a cathode-ray oscilloscope. The pH series gave one-peaked curves; the growth optimum lay in solutions without metallic cations at pH 5 and in those with metallic cations (K or Na) at pH 6. The total growth was much greater in the latter case. Of several anions tested, only acetate had a slight retarding influence; of the cations, the monovalent ones retarded growth as compared with the bivalent. Potassium retarded growth considerably in comparison with other cations. Higher concentrations of  $\text{CaCl}_2$  had only a slight retarding influence, whereas higher concentrations of  $\text{KCl}$  reduced the growth intensity to about a third. Heteroauxin retarded growth at short intervals (3 hr.) beginning at  $10^{-10}$  moles per liter. The reaction changed with time, so that a stimulating effect was observed with  $10^{-8}$  moles per liter after 6-8 days. The effect of auxin was also a function of the salt concentration. The root normally exhibits a negative electrical charge as compared with the ambient medium. The middle of the elongation zone is characterized by a PD maximum, which is 20-30 mv. higher than at 4 mm. behind the tip. The distribution

of PD along the growing part of the root normally paralleled the distribution of the elongation rate of the cells, but showed some characteristic changes in salts of higher concentration. Observations supported the theory of a transport of auxin within the root tip by means of electrophoresis. A hypothesis is developed according to which growth is regulated by the ion equilibrium and electrical charge of the root surface; it is based on the thesis that the growth-promoting activity of the auxin is linked up with its ionic effect in the cellulose membrane. There are 26 references.

The role of boron in plant metabolism.—I, Boron in relation to the absorption and solubility of calcium, M. E. SMITH. (Univ. Calif.). (*Austral. Jour. Expt. Biol. and Med. Sci.*, 22 (1944), No. 4, pp. 257-263).—In the cells of squash leaves, about 50 percent of the B and 70 percent of the Ca were found immobilized in the cell wall or intercellular substance; these elements were readily extracted from the wall material by dilute acid but not by dilute alkali. A comparison of the B distribution in cells of deficient, normal, and high-B leaves suggested that it is of importance in the cytoplasm and wall but not in the chloroplasts or vacuole. There was a positive correlation between B and soluble Ca in squash plants, but the relationship was not as marked as in the corn plants of Marsh and Shive (E. S. R., 85, p. 167). Increasing amounts of B induced appreciable increases in cytoplasmic Ca; this Ca is believed to be associated with proteins. Radioactive Sr can be used as a qualitative tracer for Ca in the cell, but the representation is not quantitative. In the leaves of normal tomato plants, Sr does not attain the concentrations in chloroplasts and vacuoles that is expected by analogy to Ca. B deficiency results in an increase of soluble Sr in tomato leaves.

Studies in the metabolism of plant cells.—II, Effects of temperature on accumulation of potassium chloride and on respiration, R. N. ROBERTSON (*Austral. Jour. Expt. Biol. and Med. Sci.*, 22 (1944), No. 4, pp. 237-245, illus. 7).—The effects of temperature on respiration, salt respiration, and salt accumulation were investigated in cut carrot tissue. The salt used was KCl and the tests were made at 7°, 13°, 19°, and 25° C. The results led to the conclusion that there is a very rapid adjustment after immersion of the tissue in the salt solution resulting in equality of concentration in cells and in the external solution; this equilibrium was independent of temperature. The temperature effects on the subsequent salt accumulation can be explained on the assumption that there is a region of the cell where the salt is maintained in constant concentration and that it is accumulated from this region by an energy-consuming process dependent on the energy released in respiration. In view of earlier work (E. S. R., 87, p. 201), it is considered that this energy comes from the salt respiration process. The salt accumulation, salt respiration, and ground respiration are shown to have high temperature coefficients. The region of constant concentration is believed to be independent of temperature and not to limit the rate of salt respiration.

Tolerance to salt spray of plants of coastal dunes, H. J. OOSTING (*Ecology*, 26 (1945), No. 1, pp. 85-89, illus. 1).—Growth form, succession, and zonation of coastal vegetation were found more or less controlled by the relative tolerance to salt spray of the various species. The range and variation of tolerance of 15 North Carolina species were determined for naturally growing plants by spraying them artificially with sea water 1, 2, 3, and 4 times daily, their percentage of foliage injury or death being recorded for each of the 9 days of the experiment. *Spartina patens* and *Atriplex arenaria* were unaffected by any of the treatments; on the other hand, *Leptilon canadense* was seriously injured after a single spraying. Between these extremes the responses indicated a graded series of tolerances in which no two species were identical. In general, the plants characteristic of habitats most subject to salt spray were least affected; those with the toughest

leaves and heaviest cuticle were most resistant, but some others were also similarly tolerant. The more frequent the sprayings the sooner the responses became noticeable. Several annuals of exposed dunes proved highly susceptible to spray injury, but probably survive because they mature between storms and thus provide seeds for another season. The majority of the plants were more or less affected by the spray, but the progress of the injury was, in general, relatively slow. Apparently, most coastal species are relatively tolerant and are eliminated by spray only in the most severe storms of exceptional duration.

**Studies on the carbohydrate nutrition of roots,** H. BURSTRÖM (*Lantbr. Högsk. Ann. [Uppsala]*, 9 (1941), pp. 264-284).—In this study of sugar utilization by isolated wheat roots, glucose was found readily assimilated, giving an economy coefficient of 0.5 from the lowest concentrations up to 0.1 mole; from pure solutions, fructose was assimilated more slowly, but with the same economy coefficient. From mixtures of the two, only glucose was absorbed. It is thus assumed that glucose is assimilated directly; fructose, only after conversion to glucose. Sucrose was rapidly inverted by the roots, the hexoses appearing in the external solution; this hydrolysis was shown to occur on the contact surface between root and solution. The rate of inversion decreased with increasing pH from 3.7 to 7.4. Roots of rye inverted sucrose slowly, the rate being about one-tenth that of wheat; its roots grew excellently on sucrose, as also on glucose and fructose. Wheat roots fed sucrose soon died, all cell divisions in the meristem being inhibited; it was shown that the injurious principle is the sucrose itself, and a hypothetical explanation is offered. Roots grew more slowly on maltose than on glucose, and with an economy coefficient of about 0.2. Maltose is probably not entirely hydrolyzed before use, also being consumed without splitting up into glucose. Maltose is likewise hydrolyzed on the root surface, but very slowly. The nature of the hydrolysis of disaccharides on the root surface is discussed; it is apparently not identical with the usual enzymatic hydrolysis. There are 22 references.

**Photosynthesis and assimilation of nitrate by wheat leaves,** H. BURSTRÖM (*Lantbr. Högsk. Ann. [Uppsala]*, 11 (1943), pp. 1-50, illus. 5).—With nitrate absent, CO<sub>2</sub> from the air was found to be quantitatively assimilated to sugar, hexose (content fairly constant) being first formed, whereas sucrose behaved as a typical reserve food. In darkness, plants containing nitrate broke down sugar only to CO<sub>2</sub>, which was quantitatively given off as respiration CO<sub>2</sub>; the nitrate accumulated within the leaves was not assimilated in darkness. Stored nitrate was assimilated only in light; with increasing light intensity there was an increase in nitrate assimilation, apparent assimilation of CO<sub>2</sub>, and formation of sugar. In leaves containing nitrate the apparent assimilation of CO<sub>2</sub> in light exceeded the formation of sugar, the difference being proportional to the amount of assimilated nitrate. On each mole of assimilated nitrate 14 moles of CO<sub>2</sub> from the air were bound up—on the average—into compounds of nonsugar character; these are termed "CN assimilates." Without an external CO<sub>2</sub> supply to plants containing nitrate, the sugar break-down was independent of light. The liberated CO<sub>2</sub> was assimilated again, but only to CN assimilates in connection with the assimilation of nitrate; this process increased with the light intensity. Assimilation of nitrate could not be connected with the respiratory break-down of sugar, but was closely related to photosynthesis. In photosynthesis, primary assimilates of two kinds appeared, viz., sugar and—in the presence of nitrate—CN assimilates; the two were to some extent formed in amounts independent of each other. Ammonium was assimilated even in the dark, at the expense of stored sugars; this reaction probably does not interfere with either the assimilation or the respiration of CO<sub>2</sub>.

It is concluded that in the light nitrate is reduced to some product (not ammonium) reacting with some intermediate product of CO<sub>2</sub> assimilation (not sugar) to form

CN assimilates. The CN assimilates of the entire plant contain C and N in the same proportions as the plant as a whole (minus stored sugars); they must contain proteins or precursors thereof and N-free compounds. Their formation must involve plasm growth. This occurs in the light, CO<sub>2</sub> from the air being utilized, but not at the expense of stored sugar. Secondary synthesis of protein is not considered. In bulk metabolism, the sugars formed are used up for primary synthetic purposes only in the protein synthesis of the roots, which proceeds in darkness; the rest are respired as CO<sub>2</sub> or stored. The reaction requiring light is the reduction of nitrate. Not even the N-free part of the CN assimilates is formed in darkness from sugar, but only in light in connection with the assimilation of nitrate. The fact that nitrate assimilation must follow different courses in roots and leaves is discussed. There are over three pages of references.

## GENETICS

**Colchicine mitosis, chromosome contraction, narcosis, and protein chain folding,** G. ÖSTERGREN (*Hereditas*, 30 (1944), No. 3, pp. 429-467, illus. 11).—A study of the colchicine mitosis type of action by organic substances has shown that colchicine mitosis (c-mitosis) is not a solitary effect but only one of a large group of closely related (narcotic) effects, and that consequently these other effects must also be considered for a deeper understanding of c-mitosis. Among others, this group of narcotic effects includes c-mitosis, the c-tumor reaction, chemically induced chromosome contraction, narcosis (strict sense) of animals, the camphor reaction of yeast, and many cases of poisoning effects by organic substances. These reactions are characterized by a water solubility correlation, the activity increasing with decreasing solubility of the substances; the activity is largely independent of the chemical constitution of the substances and is believed to be to a large extent conditioned by physical rather than chemical properties. In many cases the activity thresholds of the different effects have rather similar values. A new hypothesis as to the mechanism of these reactions is presented which is said to be closely related to the Meyer-Overton lipoid-water partition theory and to give an intelligible significance to the constant threshold value of the narcotic concentration in the "lipoids." The reason why  $\beta$ -naphthalene derivatives have a much smaller range of c-mitotically efficient concentrations than the corresponding  $\alpha$ -derivatives is explained; it is experimentally demonstrated that the  $\alpha$ - and  $\beta$ -compounds differ in the same manner in their ability to precipitate an unsaturated benzene solution. The author by no means considers his hypothesis as a definite solution of the mechanism of narcosis, but rather as a contribution to the discussion, founded in part on assumptions which need further experimental verification. There are 41 references.

**Cytogenetic studies on *Rumex* subgenus *Acetosella*,** A. LÖVE (*Hereditas*, 30 (1944), No. 1-2, pp. 1-136, illus. 213).—This review (189 references) and monographic study is presented as a link in investigations of the significance of polyploidy in the evolution and speciation in the plant kingdom; the genus *Rumex* is considered as offering ideal material for an attack on the cytogenetics, taxonomy, and speciation in plants. The principal matters considered are the geographical distribution of the subgenus *Acetosella*, description of the methods of study used, and the findings with regard to mitosis, types of meiosis, sterility, interspecific crossing experiments and the possible occurrence of agamospermy, sex determination, sex ratio, and chromosome number in relation to the morphology and physiology of the plant. The evolution of the three subgenera of *Rumex* and the four species of the subgenus *Acetosella* is discussed on the basis of the results obtained by the author and previous investigators. The problem of "intraspecific polyploidy" is considered at some length; it is believed that all intraspecific polyploids may be distinguished as separate species. Some general remarks are offered on the evolution of sex mechanisms, as based on the present findings.

**On the chromosomes of a new Mahonia-Berberis hybrid, A. LEVAN (*Hereditas*, 30 (1944), No. 3, pp. 401-404, illus. 1).**—In the cross *M. aquifolium*  $\times$  *B. sargentiana* the chromosome number of the hybrid and of both parents—as expected—was  $2n = 28$ ; what makes this cross of special interest cytologically are, however, the differences in the chromosomes as to size in the parents v. the hybrid. These findings are discussed, with possible interpretations.

**A pentaploid F<sub>1</sub> hybrid between two diploid Potentilla species, A. and G. MÜNTZING (*Hereditas*, 30 (1944), No. 4, pp. 631-638, illus. 6).**

**Fluorescein-induced parthenocarpy, C.-H. LIU and C.-H. LOU (*Nature [London]*, 155 (1945), No. 3923, p. 23, illus. 1).**—The authors report the induction of parthenocarpy by use of fluorescein in plants of the Solanaceae and Cucurbitaceae.

**The influence of seed size and hulls on X-ray susceptibility in cereals, K. FRÖTER and A. GUSTAFSSON (*Hereditas*, 30 (1944), No. 4, pp. 583-589).**—Examination of seed properties with respect to their possible significance in X-ray induction of mutations indicated (1) that an increase in seed size—and accordingly also of embryo size—causes better germination and more vigorous growth after treatment, except for the highest dose used, when the average leaf length decreased, and (2) that the hull covering in barley and oats makes the seeds less susceptible to irradiation. The latter result was obtained after a comparison of covered and naked varieties in barley, as well as of normal and hull-less seeds in Victory oats.

**The degree of extramedial response to hybridity in the growth of the mesocotyl and coleoptile in a series of hybrids in maize, B. PHINNEY and E. C. ABBE. (Univ. Minn.). (*Minn. Acad. Sci. Proc.*, 11 (1943), pp. 58-62, illus. 4).**—Six corn hybrids and their respective parents were used in studying the degree of extramedial response to hybridity developed for mesocotyl and coleoptile lengths, with the following conclusions: The extramedial hybridity quotients (med. H. Q.'s) of the seedling characteristics were correlated neither qualitatively nor quantitatively with the med. H. Q.'s for the characteristics of the older plants. It thus follows that in this material it would be impossible to predict the med. H. Q.'s of the characteristics of the older plants from those of the seedlings. There was neither a qualitative nor a quantitative correlation between the med. H. Q.'s for mesocotyl length and coleoptile length within the same hybrid. These findings support the idea that expression of the interaction of the genes in a hybrid depends on the character studied and the time in ontogeny when it develops.

**The degree of extramedial response to hybridity in the growth rates of plant and ear in a series of hybrids in maize, E. C. ABBE and K.-W. WANG. (Univ. Minn. et al.). (*Minn. Acad. Sci. Proc.*, 11 (1943), pp. 51-58, illus. 5).**—An extramedial response to the state of hybridity is defined for quantitative characteristics as the extent by which the hybrid departs from the mean between the parents. The extent of this response may be expressed in terms of a quotient which has the advantages accruing to a statistical constant. This quotient is here referred to as the extramedial hybridity quotient (med. H. Q.). Four inbreds and their six hybrids formed the basis for this study of the degree of response attained in three characteristics of each hybrid. The degree of extramedial response in each of the hybrids is presented in terms of the med. H. Q. for each of three characteristics, viz., plant height and dry weights of plant and ear. Each characteristic is considered developmentally as well as at maturity. The degree of response in any one characteristic was usually higher during the most active period of growth than at maturity; i. e., the hybrids grow at a more rapid rate and mature sooner than their parents. The hybrid having the lowest or highest med. H. Q. in any one respect also tends to have the lowest or highest one, respectively, in other respects. The remaining hybrids varied considerably among themselves, but occupied intermediate positions between the best and poorest hybrids. When the absolute med. H. Q.'s of the various hybrids were compared it was evident

that the correlation in the degree of the extramedial response for different characteristics of the same hybrid was not very great; therefore the degree of response in one character may not be used for predicting the degree of response in another character in the same hybrid. These observations suggest that each characteristic of a hybrid is controlled by certain genes that do not affect the development of the various characters to the same degree, and that those genes which control one character may be in a greater state of hybridity than those which control another.

**Structure and growth of the mesocotyl in the mutant of maize, dwarf-1, A.** HANSEN and E. C. ABBE. (Univ. Minn.). (*Minn. Acad. Sci. Proc.*, 11 (1943), pp. 45-51, illus. 4).—One of the mutants affecting corn stature is known as dwarf-1; it is a seedling character readily differentiated even in the early stages of development and thus is well adapted to a study of gene action in the early ontogeny of the plant. This work was undertaken because the manner in which this gene for dwarfism influences the structure of the mesocotyl of the seedling plant had not been studied; the results are discussed and tabulated.

**The  $M_{s_2}$  A  $V_{10}$  linkage group in sorghum,** J. C. STEPHENS and J. R. QUINBY. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 6, pp. 209-217, illus. 2).—Association of factor pairs for awnless v. awned lemmas ( $Aa$ ) and for green v. virescent-yellow plants ( $V_{10} V_{10}$ ) with the normal v. male-sterile factor pair,  $M_{s_2} m_{s_2}$  in sorghum is reported on.  $M_{s_2}$  and  $V_{10}$  showed complete dominance over their respective allelomorphs in  $F_1$  and  $A$  almost complete dominance. Single-factor segregation was indicated in  $F_2$  and backcross populations, although in most populations recessive classes were short of the expected numbers. The indicated order of genes with cross-over percentages is  $m_{s_2}$  (10.9)  $a$  (9.1)  $v_{10}$ . See also an earlier note (E. S. R., 91, p. 527). Since the factors for awns and virescent plants, easily observed characters, are linked with that for male sterility, a guide is provided for removal before pollination begins of a large proportion of normal plants from a population segregating for male sterility.

**Estudio de la herencia de la resistencia al Puccinia graminis tritici y otros caracteres en los cruzamientos de las variedades de trigo Sinvalocho  $\times$  Premier y Sinvalocho  $\times$  Regent** [Investigation of the inheritance of resistance to *P. graminis tritici* and other characters in crosses of the wheat varieties Sinvalocho  $\times$  Premier and Sinvalocho  $\times$  Regent], R. CORTAZAR SAGARMINAGA ([Chile] *Agr. Téc.*, 4 (1944), No. 1, pp. 88-97, illus. 2).—An analysis is made of the factors for inheritance in the above crosses.

**Inheritance of number of seeds per pod and leaflet shape in the soybean,** W. E. DOMINGO. (Ill. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 8, pp. 251-268, illus. 7).—Data were obtained from 26 crosses between soybean parents with mean seeds-per-pod values ranging from 1.05 to 3.59 and with either ovate (normal), lanceolate (narrow), or oval terminal leaflets. Number of seeds per pod, while influenced somewhat by environment appeared to be governed largely by a few major and several minor genes. In the case of one allelomorphic pair of major genes,  $Lo$  exhibits considerable dominance over  $lo$  and produces an intermediate seeds-per-pod value;  $lo$  produces a low seeds-per-pod value. Existence of a major recessive gene which produces a high seeds-per-pod value v. an intermediate value produced by its dominant allelomorph was suggested. Plants with oval-shaped terminal leaflets differ from plants with normal leaflets by one leaflet-shape gene;  $Oo$  and  $Oo$  produce normal leaflets and  $oo$  produces oval leaflets. Data from the normal-leaflet  $\times$  narrow-leaflet crosses substantiated earlier reports that a single gene difference is involved.  $NaNa$  and  $Nana$  produce normal leaflets and  $nana$  produces narrow leaflets.  $F_1$  plants of crosses between narrow-leaflet plants and oval-leaflet plants had normal leaflets and the  $F_2$  population segregated in a 9 normal: 3 oval: 4 narrow ratio. Genotypes associated with particular phenotypes

are *Na-O*-normal, *Na-oo* oval, *na.naO-* and *na.naoO* narrow; *na* is therefore epistatic to *o*. The locus of *Oo* is linked with that of *Lolo* with about 8 percent crossing over, but is not linked with the loci of genes for flower color *W<sub>1</sub>JV<sub>1</sub>*, pubescence color *Tt*, cotyledon color *d<sub>1</sub>d<sub>2</sub>*, or extension of seed-coat color *i* and its allelomorphs. The locus of *Nana* is closely linked with the locus or loci of genes for high number of seeds per pod; it is not linked with the loci *W<sub>1</sub>JV<sub>1</sub>*, *Tt*, fasciation *Ff*, or seed-coat color *Gg*.

Investigations on diploid, triploid, and tetraploid lucerne, G. JULÉN (*Hereditas*, 30 (1944), No. 4, pp. 567-582, illus. 5).—Investigations were carried out on diploid alfalfa and alfalfa  $\times$  sickle alfalfa as well as on their triploid and tetraploid forms obtained by colchicine treatment. The tetraploids were regularly inferior in vitality to the diploids; on the other hand, the triploids presented a vigorous appearance, probably owing to the joint effects of polyploidy and heterosis. As to leaf shape, the chromosome doubling brought about highly differing effects within different lines. The triploids exhibited greatly enlarged leaves, and the pollen grains were larger throughout in the tetraploids than in the diploids—the triploids occupying an intermediate position in this respect. Pollen fertility was good in both triploids and tetraploids. Besides bivalents at meiosis in the diploids, univalents, trivalents, and quadrivalents occurred; anaphase disturbances were also observed. The occurrence of univalents and the anaphase disturbances were apparently closely associated. These phenomena corroborate the assumption that spontaneous alfalfa is a tetraploid species. Meiosis in triploids and tetraploids appears to be as regular as in the diploids. No correlation was found between meiotic disturbance and pollen fertility.

Genstudien an *Pisum sativum*, VI-VIII [Gene studies in the garden pea], H. LAMPRECHT (*Hereditas*, 30 (1944), No. 4, pp. 613-620; Eng. abs., p. 620; pp. 621-627, illus. 1; Eng. abs., pp. 626-627; pp. 627-630; Eng. abs., p. 629].

VI. Weitere Ergebnisse sur Vererbung der Wachslosigkeit [Further results on the inheritance of wax solubility].—The cooperation of the genes *Wb*, *Wlo*, and *Wsp* for wax were studied. It was found that *wlo* causes a complete absence of wax on the upper side of the leaflets and that *wsp* produces the same condition on all other parts of the plant. The waxy parts of the plant had exactly the same wax intensity as is caused by the other genes for the development of wax; consequently, *wlo* and *wsp* have no influence on the formation of wax by these genes. Thus recessiveness in both *wlo* and *wsp* causes complete absence of wax in the garden pea. These two genes can be considered as local inhibitors of the chemical process for formation of wax.

VII. Tragantflecken zwischen Keimblättern und Testa sowie ihre Vererbung [*Tragacanth* spots between the cotyledons and the testa as well as their inheritance].—The author describes a new variety of garden pea with two symmetrical spots on the seed coat caused by the secretion of a tragacanthlike substance on the inner side of the seed coat. This secretion of tragacanth is caused by recessiveness in a gene *tram*; the segregation in *F<sub>2</sub>* of a cross indicates that *tram* is linked with the gene for wrinkled seeds.

VIII. Das Testamerkmal griseostriata und seine Vererbung [The testa character *griseostriata* and its inheritance].—The author describes a new character *griseostriata* of the seed coat of the garden pea—a rather large pale grayish stripe. Its inheritance is conditioned by the recessive form of a gene designated *gri*. A mono-hybrid segregation of the character was found in *F<sub>2</sub>*. It is believed that the gene *Gri* is strongly linked with *M* (marbled seeds).

Artkreuzungen in der Gattung *Pisum*, insbesondere zwischen *P. sativum* L. und *P. abyssinicum* Braun [Species crossing in the genus *Pisum*, particularly between *P. sativum* and *P. abyssinicum*], G. VON ROSEN (*Hereditas*, 30 (1944),

No. 3, pp. 261-400, illus. 10; Eng. abs., pp. 390-392).—This monographic study (165 references) is an attempt to clear up the hereditary basis of the taxonomic distance between the common garden pea and *P. abyssinicum* by means of an all-round application of comparative methods; some other geographic forms of the genus have been included in the tests with the idea of bridging over the gap between the extreme representatives of this well-defined genus, viz., *asiaticum*, *elatius*, *fulvum*, *humile*, *puschki*, and *tibeticum*. In addition to the detailed cytological study, a morphological-taxonomic examination of the genus was carried out; according to current taxonomic rules it is believed permissible to separate *sativum* and *abyssinicum* as two good species. On the basis of the data afforded by the present investigation a separation of the two forms into different species is also considered fully permissible, insofar as it is held that specific differentials depend on differences in phylogeny, limited spread (the concept of ecospecies), gene (both quantitative and qualitative) differences, and cytological complications (sterility barriers). The results as a whole are believed to indicate that the essential difference between the two forms consists in a certain difference in the small quantitative genes ("polygenes"). Possibly certain structural rearrangements may be regarded as typical of *abyssinicum*; these differences doubtless have appeared during the endemic period of development of the form. Other races tested in this study have proved to lie taxonomically between *sativum* and *abyssinicum*, from which it follows that these constitute the two opposite extremes of variation within the genus. It is conceivable, however, that *fulvum* and *humile* are somewhat more remote forms; this question must be left for future study.

**Meiotic aberrations and sterility in *Alopecurus myosuroides* Huds.** H. JOHNSSON (*Hereditas*, 30 (1944), No. 4, pp. 469-566, illus. 84).—This monographic cytological investigation (94 references) of *A. myosuroides* is based on studies of inbred progenies and cross progenies from plants of different geographical origin, attention being directed especially to the fertility conditions and cytological aberrations. The somatic idiogram and normal meiosis of this diploid grass is discussed. The seven chromosome pairs—differing in length—have median or submedian centromeres, and one pair is characterized by a secondary constriction; the chiasmatata are incompletely terminalized. Meiosis in tetraploids produced by colchicine shows about half the chromosomes associated in quadrivalents. This grass behaves as a typical allogamous species, exhibiting reduced seed setting after enforced self-fertilization and considerable morphological variation in the progenies. Within F<sub>1</sub> families between plants of different origin no significant cytological aberrations were found, but within several inbred families various cytological disturbances appeared; these are described as absolute and partial asyndesis, premature centromere division, stickiness, hypercontraction, retarded meiosis, polypitosis, and syncyte formation. These aberrations were almost invariably associated with absolute ♂ sterility and largely also with absolute or almost absolute ♀ sterility. Plants with these abnormalities were homozygous for recessive factors. Most of the fertile plants were characterized by partial ♂ sterility, the pollen lethality varying greatly; this partial sterility was not as a rule connected with any meiotic aberrations. Various explanations of the partial sterility are postulated and discussed, with the conclusion that it is mainly haplontic and conditioned by mendelian factors having a gamete-lethal action; these factors may be true genes or structural aberrations without cytological effect. The importance of partial sterility as a characteristic of allogamous species is stressed, and the general occurrence of gene-controlled meiotic aberrations and their significance are discussed. The absence of numerical aberrants and cytologically detectable reciprocal translocations is pointed out, and the occurrence of specific differences in the frequency and nature of the structural aberrations is discussed.

On some effects of primary and secondary polyploidy in apples and pears, O. HEILBORN (*Lanibr. Högsk. Ann. [Uppsala]*, 9 (1941), pp. 116-126, illus. 2; *Swed. abs.*, pp. 125-126).

Chromosome doubling and cross combinations in some cruciferous plants, G. TURESSON and H. NORDENSKIÖLD (*Lanibr. Högsk. Ann. [Uppsala]*, 11 (1943), pp. 201-206, illus. 9).—Crosses between diploid winter rape and colchicine-induced tetraploids of black mustard and garden radish gave more or less sterile hybrids. Crosses between diploid winter rape and similarly induced tetraploids of charlock and white mustard failed completely, as did also crosses between similar tetraploids of charlock and white mustard. The combination diploid winter rape  $\times$  tetraploid turnip gave—besides more or less sterile hybrids—nine high-chromosomal and relatively fertile plants strongly suggesting the behavior of amphidiploids. Two intergeneric amphidiploid hybrids were obtained—one from the cross tetraploid black mustard  $\times$  tetraploid charlock and the other from the cross tetraploid charlock  $\times$  tetraploid garden radish and its reciprocal; the first was relatively fertile, whereas the second showed good pollen fertility but poor seed production in both directions.

The constitution of the *Rosa canina* complex, A. GUSTAFSSON (*Hereditas*, 30 (1944), No. 3, pp. 405-428, illus. 8).—The genetic data from various *Rosa* crosses are gathered (25 references) and brought into line with previous cytological findings. When different species or biotype complexes are intercrossed, true hybrids only arise; consequently apomixis is not present. Probably, therefore, heterogamous fertilization (egg cell = 28, pollen grain = 7 chromosomes) is the rule, and apomixis—if it occurs—is rare or is restricted to crosses within the biotype complex. Of special interest was the pronounced  $F_1$  heterogeneity when *R. canina* formed the ♀ parent, whether the ♂ one was *R. rugosa* or *R. rubiginosa*. *R. rubiginosa*, used as ♀ parent, gave a much more uniform  $F_1$ . *R. canina*  $\times$  *R. rubiginosa* was highly sterile; the reciprocal cross, normally fertile. This fact appears of some importance in discussing species limits, especially when sterility barriers are considered as demarking species. Of further interest was the internal autotriploidy occurring in the *R. canina* and *R. rubiginosa* forms examined. The extreme polymorphy of *R. canina* in nature, its heterogeneity in  $F_1$  hybrids, and its decreased autosyndesis and pairing intensity in outcrossings are understood, if the postulation of a less conspicuous autotriploidy in the former than in the latter is accepted. The *R. canina* complex (*sensu lato*) forms a coenopopulation.

Are gene mutations responsible for the growth factor requirements of micro-organisms? E. L. TATUM (*Jour. Bact.*, 49 (1945), No. 2, pp. 202-203).—An abstract.

Prevalence of "wrytail" in cattle: Further studies on the prevalence and mode of inheritance of wrytail in cattle, F. W. ATKESON, F. ELDRIDGE, and H. L. IBSEN. (Kans. State Col.). (*Jour. Hered.*, 35 (1944), No. 1, pp. 11-14, illus. 2).—A more detailed account of the work previously noted (E. S. R., 92, p. 496).

The concentration of some B vitamins in bull semen, N. L. VAN DEMARK and G. W. SALISBURY. (Cornell Univ.). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 289-291).—Fresh samples of bull semen collected for previous study, by Willett and Salisbury (E. S. R., 89, p. 49), were found to contain 0.89γ, 2.09γ, 3.71γ, and 3.63γ per cubic centimeter, respectively, of thiamine, riboflavin, pantothenic acid, and niacin. The spermatozoa counts were correlated with the content of the four vitamins. The initial sperm motility was correlated with the concentration of thiamine, riboflavin, and niacin.

Further studies of the effect of dilution rate on the fertility of bull semen used for artificial insemination, G. W. SALISBURY, I. ELLIOTT, and N. L. VAN DEMARK. (Cornell Univ.). (*Jour. Dairy Sci.*, 28 (1945), No. 3, pp. 233-241).—In a further study of the effect of dilution rate on the fertility of bull semen (E. S. R., 91, p.

146), the relation of dilution from 1 part of semen to 8, 12, 16, 24, and 50 parts of yolk citrate solution was compared. Each cubic centimeter of diluted semen contained on the average for each insemination 150, 104, 80, 54, and 26 millions of spermatozoa, respectively, but no statistically significant differences were found in the fertility rate of the semen at these five dilutions. The highest dilution was not as efficient for fertilization as the lower rates of dilution, but on the average maintained fertility as well at 4 days after collection.

**Mosaic effects in domestic birds**, W. F. HOLLANDER (*Quart. Rev. Biol.*, 19 (1944), No. 4, pp. 285-307, illus. 4).—Largely a review of mosaic cases described elsewhere, with interpretation of the findings on the basis of modern genetic developments.

**Modifications in feather pattern and growth rate following administration of thiouracil in Brown Leghorn fowl**, L. V. DOMM and B. B. BLIVAISS (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 3, pp. 367-368, illus. 1).—Regenerating feather germs of Brown Leghorn capons and cockerels receiving 0.3-0.5 gm. of thiouracil (E. S. R., 91, p. 672) daily for 24-28 days revealed a basal deposition of red pigment, which continued in capons for 18-20 days after medication ceased. Emerging breast feathers were red and showed a reduction in barbulation.

**A study of spontaneous mutation**, R. B. GOLDSCHMIDT ET AL. (*Calif. Univ. Pubs. Zool.*, 49 (1945), No. 10, pp. 291-550+, illus. 63).—The genetic composition of *px bl* *Drosophila* stock, as well as morphological and chemical changes in the formation of different genotypes by mutation aided by spontaneous mutation and X-ray, are presented and discussed. An extensive bibliography on *Drosophila* mutations is included.

**The hormones regulating reproduction—pregnancy**, C. W. TURNER. (Univ. Mo.). (*Guernsey Breeders' Jour.*, 67 (1945), No. 6, pp. 497-500, 521, 522, illus. 3).

**The hormones regulating the growth of the cow's udder**, C. W. TURNER. (Univ. Mo.). (*Guernsey Breeders' Jour.*, 67 (1945), No. 7, pp. 601-605, illus. 7).

**The hormonal control of lactation**, S. J. FOLLEY (*Jour. Roy. Soc. Arts*, 93 (1945), No. 4684, pp. 114-121).—A discussion of the role in lactation of the secretions of various endocrines, especially the anterior pituitary and ovaries. An extensive bibliography is included.

## FIELD CROPS

**Nebraska outstate crops and soils tests, variety tests for 1944**, G. T. WEBSTER (*Nebraska Sta. Bul.* 372 (1945), pp. 38, illus. 1).—Fifty of sixty-five variety tests with corn, wheat, oats, barley, sorghum, soybeans, and field beans planted throughout the State on carefully selected fields were harvested under the first year's operation of the outstate crops and soils testing program designed to supplement the work at the station and substations. In 21 corn tests, including those at the station and substations, yields were high, and the later maturing hybrids showed to good advantage because of the favorable growing season and late frost. Yield differences between many entries were small, indicating many good hybrids available to growers. Pawnee wheat continued to be outstanding, especially in southeastern Nebraska, with relative superiority decreasing from east to west. Cedar and other rust resistant oats varieties were superior in most tests. Barley yields were extremely low. Martin and Kalo 617, newer combine-type grain sorghums, gave indications of being superior. Fremont, an early maturing forage variety, showed considerable promise where early maturity is needed. Lincoln soybeans in four eastern Nebraska tests averaged 27.4 bu., Illini 25.4, and Dunfield 24.2. Scottsbluff, the new early maturing pinto field bean, yielded high in the western dryland test. Four flax varieties in the southeastern district averaged 11.5 bu. per acre, Redson leading with 12.8 bu.

Crop rotation pastures at Montrose produce more grazing in mid-summer. S. I. BECHDEL, C. F. NOLL, and S. R. SKAGGS. (Coop. U. S. D. A.). (*Pennsylvania Sta. Bul.* 464 (1944), Sup. 1, pp. 4-5, 8, illus. 5).—Crop rotation pastures at Montrose have consistently produced 1.5 to 2 times as much feed as adjoining improved permanent pastures, 1942-44. During dry years, when permanent pastures were at their worst, these rotation pastures produced from 2 to 3 times as much grazing as the permanent pastures after July, a time when the extra feed was needed most. Grass harvested during 1942 and 1943 from crop rotation pastures contained from 13.5 to 17 percent of crude protein, and from improved permanent pastures only from 11 to 13 percent.

Depth and methods of planting winter cover-crop seed in Louisiana, H. B. BROWN, D. M. JOHNS, and C. B. HADDON (*Louisiana Sta. Bul.* 375 (1944), pp. 23).—Austrian winter, Singletary, and Creole peas, hairy, common, and Willamette vetch, bur-clover, *Mellilotus indica*, and oats were planted 0, 1, 2, 4, 6, and 8 in. deep at Baton Rouge, Calhoun, and St. Joseph, and methods of planting several of these crops were compared, all within the period 1940-43. Depth of planting tests, although under widely different environmental conditions, gave very consistent results. The 2-in. depth usually gave optimum plant emergence, although the 1-, 2-, and 4-in. depths did not differ much. Coverage greater than 4 in. resulted in a lower plant emergence, poorer root development, and weaker plants. Fewer plants were inoculated with depths exceeding 4 in. Fewer nodules were on individual plants from greater depths and they were smaller. Bur-clover and *M. indica* seeds gave their best germination from surface planting, while practically none emerged from deeper than 2 in. Seed of these crops should be covered very lightly, if at all. In south Louisiana seeding with a grain drill on ridges made by the middle-burster usually gave greater tonnage of green matter than any other planting method. This method provides for more uniform seeding and coverage than other methods tested and there is better winter drainage. Seed broadcast and then covered with a middle burster run in the old middles is a simple method of planting that gives good results in south Louisiana. Broadcasting vetch or Austrian winter peas in the old middles and then covering with a middle burster run in the old row, or drilling in bar furrow on each side of old ridge and covering with a middle burster run in the old middles has given satisfactory results in north Louisiana.

Influence of site and grazing intensity on yields of grass forage in the Texas Panhandle, R. W. CAIRD. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 1, pp. 45-49, illus. 1).—Distribution of weight on the plant axis is important because along with density it determines amount of forage available to cattle. Anything causing the grass to produce taller leaves, as control of livestock grazing, makes more forage available, provided the increased growth is palatable and density is not decreased greatly. Forage yields of blue grama-buffalo grass plants are reduced heavily by overgrazing. In 1942 and 1943 clipping at a height of 1 in. showed respective totals of 1,851 and 2,265 lb. per acre from the area protected from grazing for 5 yr., while the overgrazed area produced only 918 and 1,235 lb. The protected area in 1942 made more regrowth after the first clipping in June, 1,411 lb. per acre with 280 lb. for the overgrazed area. Grasses on poor sites had only a small proportion of the forage above the first inch, while on good sites much more of the forage was higher on the plant. Blue grama, side-oats grama, and buffalo grass showed proportionate differences in height from good, average, and poor sites. Buffalo grass on poor sites produces most of the forage within 1 in. of the ground and out of reach of cattle. Under extremely heavy use, little available forage is produced though grass density is high.

The food content of forage crops as influenced by the time of day at which they are cut, O. F. CURTIS. (Cornell Univ.). (*Jour. Amer. Soc. Agron.*, 36 (1944),

No. 5, pp. 401-416, illus. 3; abs. in *Biol. Abs.*, 18 (1944), No. 8, p. 1847).—Many plats each 1 sq. ft. in area were marked off by frames inserted in a uniform field of alfalfa. In some experiments, cuttings were made at 5 a. m., 11 a. m., and 5 p. m. of the same day, in others they were made at 6 a. m. and 4 p. m. of the first day and 6 a. m. the following morning. In most cases the material was dried immediately in an oven at 80° C. In other cases the cut plants were left to dry naturally in the field.

Analyses for sugar and starch demonstrated that alfalfa samples cut early in the morning had the lowest carbohydrate when expressed, either as percentage dry weight or as total carbohydrate per unit area of field, and that carbohydrate increased from morning to noon and from noon to afternoon. The total dry matter per unit area of field also increased from morning to afternoon. This advantage in favor of afternoon cutting was independent of whether the material was dried immediately in an oven or dried naturally in the field, and was also independent of whether the afternoon cuttings followed or preceded the morning cuttings. When cut in the afternoon and allowed to lie in the field overnight and then placed in the oven at the same time with similar plats left standing intact overnight and cut the following morning, the plats cut in the afternoon were found to contain more carbohydrate and more dry matter. Grand averages of 10 sets, consisting of 7 to 9 replications for each set, indicated a carbohydrate content 83 percent higher and a dry matter yield 19 percent higher in the afternoon cuttings than in morning cuttings. Statistical analyses indicated that the differences are significant in most cases.

**Afternoon vs. morning cutting of alfalfa.** C. J. WILLARD. (Ohio Expt. Sta. and State Univ.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 11, pp. 937-939; abs. in *Biol. Abs.*, 19 (1945), No. 2, p. 376).—The author discusses the validity of the conclusions in the above paper by Curtis in the light of previous data. His thesis is that Curtis' conclusions are not justified.

**Yield and chemical content of alfalfa cut at different times of the day and night.** T. E. WOODWARD, J. B. SHEPHERD, and H. M. TYSDAL. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 11, pp. 940-943; abs. in *Biol. Abs.*, 19 (1945), No. 2, p. 376).—Contrary to the results reported by Curtis of a 19 percent gain in dry-matter content of alfalfa cut in the afternoon as compared to morning cuttings, no significant trends were found in yield per acre of dry matter, N, crude fiber, ether extract, or carotene in the alfalfa cut during the afternoon or evening compared to nighttime or morning periods of the day under the conditions of tests conducted at the Beltsville Research Center. On one field, cuttings were made in the morning of May 31, the afternoon of the same day, and the following morning. On another field cuttings were made every 2 hr. over a 24-hr. period beginning 7:00 a. m. (E.W.T.) on May 30, 1944. A slightly lower ash content and a higher N-free extract content were obtained in the late morning, afternoon, and early evening cuttings compared to other periods of the day. Any slight benefits of afternoon cutting must be balanced against practical considerations of haymaking before specific recommendations for time of cutting can be made.

**Afternoon vs. morning cutting of alfalfa: Comments on notes by Woodward, Shepherd, and Tysdal and by Willard, O. F. CURTIS.** (Cornell Univ.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 11, pp. 943-952, illus. 1; abs. in *Biol. Abs.*, 19 (1945), No. 2, p. 372).—Because their direct dry-weight measurements showed no significant differences between morning and afternoon cuttings of alfalfa, Woodward, Shepherd, and Tysdal claim that their data on yield and composition of alfalfa cut every 2 hr. over a 24-hr. period are in disagreement with the findings of Curtis. Their data on ash expressed as percentage of dry matter, however, show a regular trend, diminishing during the day to a minimum at 5 p. m., then arising at night to a maximum at 3 a. m. Since the actual ash per plant almost certainly does not

decrease during the day, it appears safe to assume that the total ash remains practically constant over a 24-hr. period and the change in percentage results from a change in total dry matter. Curves are presented showing the changes in dry matter calculated as necessary to account for observed changes in percentage ash. These indicate gains even greater than those earlier reported by Curtis. Similar curves show changes in dry matter based on the less dependable assumptions that N, N + ash, and carotene remain constant. Data on N-free extract indicate gains of about 11 to 19 percent or more in favor of afternoon cuttings. Questions raised by Willard chiefly relate to the large gain of about 500 lb. per acre reported in favor of afternoon over early-morning cutting. Curtis suggests that a 10 percent gross gain is probably more common than the recorded 19 percent again, but presents arguments why occasional gross gains of about 500 lb. per acre on clear days may be necessary to account for net gains of 100 lb. per day over the entire growing period.

[1943 and 1944] hybrid corn field trials, W. WIDAKAS and W. J. LEARY (*North Dakota Sta. Agron. Mimeog. Cirs. 75 (1944)*, pp. 12+, illus. 1; 76 (1945), pp. 15+, illus. 1).—Corn hybrids and adapted varieties (E. S. R., 91, p. 281) were tested for yield, maturity, standability, and other desired characters in four maturity zones in North Dakota. The 1943 and 1944 performances, together with average yields and moisture percentage and other data from previous years, are reported. Some hybrids were as early or earlier maturing than a good locally adapted open-pollinated variety in each maturity zone area, while other hybrids were too late for grain corn production. In the southeastern and east central trials, later hybrids than recommended in these areas yielded high but the increase in yield was not significantly higher than the good hybrids in earlier maturing groups. In the northeastern and western trials the better hybrids in the 82- to 88-day maturity groups yielded as well as, or better than, later maturing hybrids, and the corn has been more mature and of better quality. With few exceptions very late hybrids were more resistant to lodging than semilate ones, while semilate hybrids were more resistant than semiearly and semiearly in turn more resistant than early ones. Falconer, Minnesota 13, and Rainbow, open-pollinated varieties, lodged as badly as, or worse than, some weak early maturing hybrids. Because of closed and tight husks as in Falconer, Rainbow flint, and some tight-husk hybrids, the moisture in ears remains high much longer than in most of the open-husk dent types.

Minhybrid corn varieties for Minnesota, E. H. RINKE, H. K. HAYES, Y. S. TSIANG, and C. BORGESON (*Minnesota Sta. Bul. 354 (1944)*, pp. 36, illus. 12).—Information on 12 new Minhybrids released by the station in 1943 and further data on Minhybrids released before 1943 are presented in this revision (E. S. R., 86, p. 36). The corn-growing regions of Minnesota are divided into five maturity zones. Hybrids bred by the station and adapted to each zone are available. There are 25 Minhybrids and 2 Wisconsin hybrids recommended for growing in particular maturity zones.

Cotton varieties in the hill section of Mississippi, 1944, J. F. O'KELLY (*Mississippi Sta. Bul. 411 (1944)*, pp. 8).—Lint yields per acre, acre value, lint percentage, staple length, and bolls per pound of lint are reported for cotton varieties tested at the station and Holly Springs, Poplarville, and Raymond Substations for 1944 and during the period 1940-44. Leaders in average acre lint production in 1944 included Deltapine 14-622 lb., Delfos 9169 617, Cleveland 54-616, Miller 610, Hi-Bred 609, Coker 100W-3 605, and Empire 590 lb.

Varieties of flax and disease resistance, T. E. STOA. (Partly coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul. 7 (1945)*, No. 3, pp. 18-23).—Features of leading flax varieties (E. S. R., 83, p. 329) are discussed with respect to agronomic characters and resistance to wilt, rust, and pasmo, and cultural suggestions are made. Rust resistant varieties Renew, Victory, No. 5128, Walsh, Royal, Golden, and Buda

should have preference in rust areas insofar as the seed supply permits. The Goldens (Victory and B. Golden), because of short straw, may ordinarily be grown most satisfactorily on the heavier soils. Buda, the least resistant of these varieties to rust, has the most tolerance to pasmo. Of the more rust-resistants, No. 5128 should have preference in the northern counties and the earlier ripening Renew or Victory in the other sections. In the areas where the rust hazard is not so great, varieties like Bison may still be grown. Koto, Renew, Victory, Buda, and Walsh may also be used so far as the seed supply permits.

A statistical study of the relations between flax fiber numbers and diameters and sizes of stems, J. H. MILLER, M. G. BURTON, and T. MANNING. (Ga. Expt. Sta. et al.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 8, pp. 269-281, illus. 5).—Fibers of flax stems grown in Georgia were measured with median or midsections cut from stems selected at random. Fibers in the median portion of the stem were both more uniform and more numerous than those at the top or bottom. As the stem increased in diameter the numbers of fibers, of bundles, and of fibers per bundle increased. The correlation is greatest between fiber number and stem thickness. Exceptionally large stems did not exhibit the same degree of linearity of regression as those of medium or smaller diameter. A negative correlation was found between number of fibers per square millimeter and the cross-section area of the stem. Large stems have fewer fibers per unit of area than small stems. Large stems had coarser fibers than small stems; diameters of fibers in the 10 largest stems were nearly twice those of the 10 smallest. The fiber number per unit area of cross section of the Cirrus and Triumph fiber varieties was practically the same in stems of equal size, but as the average diameter of Triumph was larger, the fibers per square millimeter were fewer. Comparison of fiber numbers per stem section of equal diameter of Georgia flax with published results from Netherlands and Northern Ireland showed a reduction of about 20 percent in the former. Within flax stems of equal diameter the range of fiber and bundle numbers seemed probably wide enough to provide a basis for single-plant selections.

Growth studies on guayule (*Parthenium argentatum*), E. ARTSCHWAGER (*U. S. Dept. Agr., Tech. Bul. 885* (1945), pp. 19, illus. 6).—This detailed account of the developmental history of the secondary tissues of guayule and rubber storage, the relative development of bark and wood under different irrigation practices, and retrogressive changes in the phloem is based on studies of material from New Mexico, Texas, and California. Initial cambium activity is strictly centripetal; differentiation of new phloem cells is belated and coincides with initiation of inflorescences. The bulk of the new xylem is formed early in the season, while phloem development is continuous and synchronized with progressive inactivation of old phloem through sclerosis. There is no carry-over of undifferentiated phloem cells into the new season. Sclerosis involves all of last season's active phloem and some of the first formed phloem of the current season. Synthesis of rubber is contingent upon the slowing up or repression of growth. Under restricted water economy, rubber appears first in the ray tissue of the phloem as early as mid-summer, and very much later in the xylem. The phloem rays show heavy deposits of rubber by the end of the growing season, and additional deposits are made throughout the winter months. Winter synthesis of rubber may be from current products of photosynthesis if climatic conditions are favorable; otherwise, probably from prerubber reserves stored previously. The volume of rubber-bearing tissue in the stem varies with the thickness of bark and total stem diameter and with the percentage composition of ray tissue, sclerenchyma, and active phloem. The variation in physiological efficiency from the standpoint of rubber synthesis is to be reckoned with.

Growth, rubber storage, and seed production by guayule as affected by boron supply, J. W. MITCHELL, H. M. BENEDICT, and A. G. WHITING. (U. S. D. A.). (*Bot. Gaz.*, 106 (1944), No. 2, pp. 148-157, illus. 2).—Guayule plants were grown from early seedling stage in gravel culture for 16 mo., during which time they received nutrient solutions containing 0.0-10.0 p. p. m. of B. Older seedlings were also transplanted from the field to sand or gravel culture to determine effects of deficient or excessive B (0.0-40.0 p. p. m.) when supplied by nutrient solutions. Plants showed marked B deficiency symptoms when supplied with a B-free nutrient, but subsequently grew vigorously and produced seeds when given a solution containing 4 p. p. m. Guayule has a tolerance range of from 0.1 to 2.0 p. p. m. of nutrient solution. Percentages of rubber in gravel-culture plants indicate an optimum B requirement of 0.1-2.0 p. p. m., a range similar to that for maximum vegetative growth and seed production. Rubber concentration in stems and roots of B-deficient plants was lower than in similar parts of plants grown with adequate B. Total rubber output of B-deficient plants was relatively small, and excessive B (10 p. p. m. in the nutrient) was also associated with decrease in rubber output. Cambial activity was reduced somewhat in plants receiving excess or deficient B. B-deficient plants produced fewer and smaller seeds with poorer germination than did plants adequately or excessively supplied.

Apomixis in guayule, K. BSAU. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 30 (1944), No. 11, pp. 352-355).—In conjunction with the generative apospory, unreduced pseudogamy evidently occurs in the apomictic types of guayule.

*Imperata cylindrica*: Taxonomy, distribution, economic significance, and control (*Imp. Agr. Bur. [Gt. Brit.], Joint Pub.* 7 (1944), pp. 63, illus. 1).—*Imperata cylindrica* is a grass species widely distributed in tropical and subtropical lands, especially in open country, on abandoned cultivated land, and in deforested areas. The five recognized varieties are described and their distributions indicated. The distribution of the species is governed by factors such as methods of reproduction (vegetatively and by seed), resistance to fire, tolerance of a wide range of soil conditions, relation to temperature, and variation in atmospheric conditions. This grass often spreads over large areas, virtually excluding other grasses, yet it may also be associated with other types of vegetation. It frequently appears as a weed in cultivated areas and plantations of various economic crops. Effects of *I. cylindrica* on *cinchona*, tea, rubber (*Hevea brasiliensis*), teak, fig, coconut, oil palms, sal (*Shorea robusta*), and abaca are generally adverse, with certain benefits to tobacco and sugarcane. The grazing and fodder value of *I. cylindrica* has been tested in a number of tropical and subtropical countries with the general conclusion that, although the grass provides animal fodder in certain types of less advanced agriculture, it will ultimately be replaced by superior species managed according to modern methods. It may be used with varying success in thatching, paper making, and soil conservation. Methods of controlling this grass include mechanical, chemical and cultural methods of complete eradication, and other treatments such as rolling, cutting, burning, and grazing. An extensive list of common names in many languages and dialects is appended, with a bibliography of 150 titles.

Oats varieties and rust, T. E. STOA. (Partly coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 3, pp. 8-10).—Comparative yields and rust resistance of oats varieties (E. S. R., 89, p. 60; 90, p. 617) including Gopher, Marion, Boone, Vieland, Tama, Ajax, and Clinton (early); Rainbow, Vanguard, and Markton (mid-early), and Victory and Exeter (mid-late) oats are reported and discussed from tests 1939-44 at Fargo, Edgeley, Dickinson, Williston, and Langdon.

Cutting Irish potato seed pieces, L. W. NIELSON and M. E. GARDNER (*North Carolina Sta. Bul.* 349 (1945), pp. 13, several illus.).—The potato seed piece most practical under North Carolina conditions evidently should weigh at least 1.5 oz.

Tests showed that yield increases with size of seed pieces, in harmony with results elsewhere. Larger seed pieces require more seed per acre but insure better stands, larger plants, and higher yields. Many growers in the State have been planting seed pieces averaging 1 oz. or less in weight.

The construction of a homemade seed cutter and its operation is described and illustrated. Pieces cut with the cutter have averaged 1.2 oz. and with a hand knife 0.82 oz.; and 2.1 and 2.9 percent, respectively, were eyeless. Any slight increase in the number of eyeless pieces resulting from use of the cutter would be offset by its benefits.

**Sedge boats in the Andes.** A. A. BEETLE. (Univ. Calif.). (*Jour. N. Y. Bot. Gard.*, 46 (1945), No. 541, pp. 1-4, illus. 3).—Stems of the bulrush (*Scirpus tatora*) are used by natives of the Andes to make small boats (balsa), mainly used for fishing on Lake Titicaca.

**Cattle like "Suiter's grass,"** W. C. JOHNSTONE. (Univ. Ky.). (*South. Agr.*, 74 (1944), No. 11, p. 14).—Kentucky 31 fescue or Suiter grass, a bunchgrass resembling orchard grass in growth habits, thrives under a wide range of conditions, is persistent in sod, makes a fair winter cover crop when seeded in late summer, and provides considerable pasture and some seed in the following spring. It has made satisfactory growth in outlying tests of the Kentucky Experiment Station. At the Robinson Substation in the mountains, the grass has been in a pasture mixture for 7 yr. There cattle have relished it, and it has persisted well in a grass and legume mixture.

**Suiter's grass, or Kentucky 31 fescue,** H. SEVERSON (*Seed World*, 56 (1944), No. 11, pp. 8, 10).—A further discussion of the grass mentioned above.

**Leaf-punch nitrogen studies on first ratoon crop of 32-8560 at Waipio,** M. DOI (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], 48 (1944), No. 4, pp. 237-247, illus. 5).—Attempts were made to develop an index of the N requirement of sugarcane in a study of the progressively changing N fraction in the blades of the plant at frequent intervals during its growing cycle. Progress of the research is discussed, together with difficulties encountered in accurately appraising the observations and data. The leaf-punch (E. S. R., 82, p. 179) analyses reflected the different N levels in the active cane leaves resulting from the differences in available nitrogen supply, age, and weather. However, interpretation of N indices for guidance of N fertilization for the first ratoon crop was not easy. A major difference observed in the field between the plant and first ratoon crop, aside from authentic differences in growth factors, was that the latter crop had more primary stalks to start with. With leaf-punch analyses alone, the optimum N level for the early stage of growth was not definitely ascertained.

**A search for guidance in the nitrogen fertilization of the sugar cane crop.—II, The first ratoon crop,** R. J. BORDEN (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], 48 (1944), No. 4, pp. 271-306, illus. 17).—A second series of measurements and analyses made on representative samples of 32-8560 cane from the first ratoon crop (E. S. R., 89, p. 63) is reported. Additional supplementary information about the nature of the development of this variety and of its composition at progressive growth stages has been accumulated and studied, and many interesting relationships found. A treatment in which N 40 lb. was applied July 1, 60 lb. September 10, and 60 lb. April 27 (160 lb.) was considered optimum. Some of the more specific effects from the different N applications are pointed out. The soil has contributed some of its N to the crop. The heavier N fertilizer applications have resulted in greater yields of green weight, dry weight, and millable cane, higher percentages of moisture, of reducing sugars, and of nitrogen in dry weight, leaf blades, and crusher juice, but lower percentages of fiber, of sucrose, of P and K, and a lower yield percentage cane (poorer quality).

**Kinds and varieties of sweetclover**, C. J. WILLARD (*Ohio Sta. Bim. Bul.* 232 (1945), pp. 22-26).—In general, the station finds that white sweetclover (standard, medium-late) should be used whenever desired to cut hay in the seeding year or for pasture use, because of its later maturing and larger yield. Either white or yellow (commercial) sweetclover may be used satisfactorily for soil improvement as a catch crop in a 2-yr. corn-small grain rotation. Yellow sweetclover is much superior for any summer seeding and for establishing itself in dry seasons or climates. Results of further variety tests (E. S. R., 57, p. 733) are summarized for the period 1929-44. Madrid (yellow) and Evergreen (white) sweetclovers (E. S. R., 90, p. 334) have been outstanding varieties.

**Production and utilization of hairy vetch**, J. L. ANTHONY (*Mississippi Sta. Bul.* 408 (1944), pp. 18).—Cultural, fertilizer, and utilization experiments with hairy vetch were made 1938-43 at four locations and on Grenada silt loam and Ruston and Savannah fine sandy loams. Vetch yields in most experiments were greater in the last 2 yr. than in the first 2 yr. Since P increased vetch yield much more than did K or lime, P was indicated as the nutrient most needed for maximum vetch production. In a rotation, fertilizer (10-8-4) required by both vetch and cotton following might be applied to either crop. Removal of the first crops of vetch as hay did not reduce materially the yield of following crops of cotton when compared to cotton receiving commercial N. Continued removal of vetch, however, did result in reduced yields of subsequent crops of cotton. N supplied by vetch turned under resulted in a yield in the following cotton almost equal to that of cotton not after vetch but receiving 200 lb. sodium nitrate (N 32 lb.).

**Quality characteristics of wheat varieties grown in the western United States**, C. C. FIFIELD, C. E. BODE, H. C. FELLOWS, R. WEAVER, J. F. HAYES, A. CHRISTIE, B. E. ROTHEGEB, and E. HOFFECKER (*U. S. Dept. Agr., Tech. Bul.* 887 (1945), pp. 35, illus. 6).—Quality characteristics as determined by chemical, physical, milling, and bread- and pastry-baking tests are reported for 44 varieties of winter and spring wheats grown 1933-39 in irrigated and nonirrigated experimental trials at a number of experiment stations in the western United States. Included were the important commercial wheats of the region and a number of new and more promising varieties.

Irrigated grain resembled the nonirrigated grain grown in the same region in protein content and bread and pastry qualities, except that Baart grown under irrigation produced bread slightly inferior to Baart grown without irrigation. Hard winter wheats averaged slightly higher in protein content and test weight and produced better bread and poorer cakes and cookies than soft winter varieties grown under the same conditions. Turkey and Rio appeared to be the best varieties for bread. Relief, a dwarf smut-resistant variety, was slightly inferior in bread-baking qualities. All soft winter wheats produced satisfactory cakes and cookies, Triplet being the best, with Goldcoin, Rex M1, and Athena being only slightly inferior. Baart grown without irrigation was the best or among the best of the spring wheats for bread and also produced satisfactory cakes but poor cookies. All strictly soft spring varieties were satisfactory for cakes and cookies. Pacific Bluestem, Idaed, Union, Dicklow, Lemhi, and Jenkin made the best cakes, and Jenkin and Union the best cookies.

Scatter diagrams and correlation coefficients calculated only for the nursery tests showed yield of grain and its protein content to be negatively correlated. Dough-ball time and flour protein appeared more useful than other determinations except the bread-baking test for predicting bread quality. The dough-ball time and loaf-volume relations appeared to be somewhat different for Baart in the nonirrigated nurseries and for Rex, Rex M1, and Rex M2 in the winter wheat nurseries as compared with other varieties. These results suggest that dough-ball time, in conjunction with protein analyses, may be useful in breeding varieties of superior

quality for bread when certain parents are used. Particle-size index, highly correlated with cake grain-and-texture scores and also with the cooky factor, appeared to be associated more intimately with pastry qualities than is either flour protein or dough-ball time. The correlations for bread-loaf volume on the one hand and cake grain-and-texture scores and cooky factors on the other were negative, but not always significant. The several exceptions shown to the assumed negative relation between bread and pastry qualities indicated that it might be possible to produce varieties reasonably good for either bread or pastries, depending upon the protein content of a particular lot of the wheat.

**Comparative performance of wheat varieties in eastern Washington,** O. A. VOGEL and O. E. BARBEE. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 450 (1944), pp 28).—Results of variety trials with wheat (E. S. R., 70, p. 771) made 1931-43 at Pullman, Walla Walla, and Pomeroy are reported with emphasis on yield, test weight, shattering, maturity, plant height, lodging, winter survival, and growth habit. The 38 varieties studied are described with regard to characteristics influencing their usefulness.

Field and nursery performances, desirable milling and baking qualities, and resistance to many races of bunt, including dwarf bunt, indicated Orfed and Hymar to be the most useful of the white fall-sown varieties. Rio (susceptible to dwarf bunt) appears to be the best hard red winter variety. Idaed, Onas, and Fedawa among spring varieties have better performance records than Federation. Idaed was the best variety at Pomeroy, whereas Fedawa excelled at Pullman and Walla Walla. Orfed had not been tested enough to determine its full value as a spring wheat. Baart continues to be the recommended variety for the drier areas.

**Comparative effects of variety and environment on some properties of North Dakota hard red spring wheat flours,** R. H. HARRIS, L. D. SIBBETT, and G. M. SCOTT. (N. Dak. Expt. Sta.). (*Cereal Chem.*, 22 (1945), No. 1, pp. 75-81, illus. 3).—Eight hard red spring wheats (56 samples) grown at 7 stations in North Dakota in 1943 were milled into long patent flours which were subjected to analysis and baking tests. Very significant variations in flour yield, flour ash, flour protein content, and loaf volume existed between varieties and environment, with the latter exerting the major influence. Loaf volume differed significantly between varieties and stations for both micro baking methods at the uniform protein level, indicating differences in protein quality due to both varietal and station influences. Mixograms at a uniform protein level showed significant variations between varieties and environments for dough development stage, range of dough, stability, curve height, and width.

**Pesky plants: Identification and control of obnoxious, irritating, and poisonous plants of parks, resorts, and beaches,** R. B. HARVEY, A. H. LARSON, R. H. LANDON, and L. C. ERICKSON (*Minnesota Sta. Bul.* 381 (1944), pp. 56, about 30 illus.).—Information is given on the characteristics, growth habits, and control of irritant or blister-causing plants, including poison-ivy, poison sumac, poisonous spurge, stinging nettles, and smartweeds; poisonous plants—jimsonweed, water-hemlock, waterparsnip, wild hemp, and black nightshade; plants with thorny fruits—sandbur, beggarticks, sticktight, tick trefoil, burdock, and houndstongue; plants with thorny stems or leaves—prickly-ash, horsetail, and bull, roadside, and Canada thistles, rice cutgrass, prickly lettuce, buffalo-bur, greenbrier, and wild blackberry; and water plants—hornwort (coontail), pondweeds, *Elodea*, eelgrass (ribbon grass), bulrushes, sedges, and algae.

**Weed control: Sodium chlorate as a herbicidal agent in pastures,** F. E. HANCE (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], 48 (1944), No. 4, pp. 233-235).—Hazards in connection with sodium chlorate as a herbicide and ways of avoiding them are discussed briefly.

## HORTICULTURE

Indian gardening in El Salvador, F. L. WELLMAN (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 3, pp. 47-49, 57 illus. 4).—Stating that the natives of El Salvador have been growing gardens since long before the advent of Europeans, this article describes the terrain, the climate, the crude practices and equipment, the types of vegetables grown, etc.

Possible influences of new organic pesticides on experimental test procedure, J. D. WILSON and J. P. SLEESMAN (*Ohio Sta. Bimo. Bul.* 232 (1945), pp. 27-30).—Trials were conducted with various new proprietary materials to establish their effectiveness, compatibility with other materials such as bordeaux mixture, safe dosages, etc., with special reference to precautions necessary in testing technic.

Labeling vegetable seed stocks for germination, M. T. MUNN. (N. Y. State Expt. Sta.). (*Farm Res.* [*New York State and Cornell Stas.*], 11 (1945), No. 2, pp. 13-14).—Field trials show that the percentage of germination, as stated by the vendor on the packet or other container, is an important index to the performance of the seed. In general there appeared to be two classes of seed distributors, those who aim toward perfection, and those who are satisfied with an average or mediocre standard of quality.

Asparagus production in Michigan, S. B. APPLE and K. C. BARRONS (*Michigan Sta. Cir.* 194 (1945), pp. 23, illus. 12).—General information is presented on the status of asparagus production in Michigan and elsewhere, production of plants, handling of young crowns, soil preparation for the permanent beds, planting, weed control, fertilization, harvesting and handling the marketable product, varieties, etc.

The effect of some environmental factors on the set of pods and yield of white pea beans, J. F. DAVIS. (Mich. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], 70 (1945), No. 7, pp. 237-249, illus. 1).—The effects of temperature, humidity, soil moisture, leaf area, and fertilizer on the behavior of the white pea bean (*Phaseolus vulgaris*) were investigated both in the greenhouse and in the field.

From the field studies the following conclusions were reached: Maximum temperature influences the set of pods more than any other of the factors studied, and the percentage set of pods can be predicted from maximum temperature with a fair degree of accuracy; minimum relative humidity and soil moisture, within the limits encountered in the work, exert only a minor influence on the set of pods; the relation of leaf area to yield of beans may range from a positive to a negative correlation depending on the weather prevailing during the blooming period, so that the yield of beans cannot be safely predicted from leaf area; and fertilizer had no effect on set of pods.

The response to environmental factors of plants grown under greenhouse conditions differed in certain important respects from that of plants grown in the field.

A study of this nature is deemed valuable for determining what areas may be best suited for crops that, like the white pea bean, have critical environmental requirements.

Variety studies give information on yields and other characteristics of celery strains, L. H. POLLARD and F. B. WANN (*Farm and Home Sci.* [*Utah Sta.*], 6 (1945), No. 1, pp. 8-10, illus. 2).—Approximately 200 cars of celery were shipped from Utah in 1944. Variety trials in 1944 showed the strains of the Cornell variety to be best among self-blanching types. In earlier tests from 1940-42 the Utah variety proved to be the best green type celery for Utah conditions. Determinations by E. B. Wilcox of the vitamin C content of various celeries showed little difference among the 11 kinds tested, with the range from 9 to 13 mg. of ascorbic acid per 100 gm. of fresh stalk tissue. In general the Utah strains were somewhat higher than the Cornell variety. The tender inner stalks

were higher in ascorbic acid than the larger outer stalks. With respect to sugar content of the juice expressed from frozen stalk, the highest content was found in a Cornell strain. There did not appear to be any correlation between sugar content and that of ascorbic acid. The Cornell variety appeared to accumulate more sugar toward the end of the growing season than did the Utah variety.

As to the breakdown trouble known as heartburn, most of the self-blanching kinds, particularly the Cornell strains, seemed to be more resistant than the Utah strains.

Promising varieties of sweet corn for Utah, L. H. POLLARD and E. B. WILCOX (*Farm and Home Sci. [Utah Sta.], 6 (1945), No. 1, pp. 11-12, illus. 1*)—In 1943, 20 of the more promising varieties of sweet corn were grown under like conditions and the canned and frozen products compared as to ascorbic acid content and general palatability. The ascorbic acid of the fresh corn ranged from 16.6 to 26.5 mg. per 100 gm. and the carotene from 0.012 to 0.167 mg. per 100 gm. The loss in ascorbic acid from blanching varied from 23.4 to 53.8 percent. Washing the blanched corn in preparation for freezing or canning resulted in a further loss of ascorbic acid averaging 7.5 percent. An additional loss of ascorbic acid during the freezing process averaged 13.5 percent and during canning 25.8 percent. The freezing and canning processes caused practically no loss in carotene.

As to eating quality the following varieties, listed in order of maturity, scored highest in most of the tests: Spencross, Marcross, Seneca Golden, Lincoln, Golden Cross Bantam, Illinois Hybrid 10, Ioana, Illinois Hybrid 11, and Aristogold.

Sweet corn hybrids for western N. Y., J. I. SHAFFER, JR. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 11 (1945), No. 2, pp. 5, 12*).—An appraisal is presented of various sweet corn hybrids as to their usefulness for canning and freezing preservation. Golden Cross is rated as supreme in its maturity group. At Geneva Golden Cross matures its ears in 80-81 days from planting. Other corns discussed include Seneca Golden, Tendergold, Lee, Lincoln, Ioana, and Tendermost.

Growing sweet corn for the cannery, J. H. BEATTIE (*U. S. Dept. Agr., Farmers' Bul. 1634, rev. (1945), pp. 18+, illus. 1*)—This revision (E. S. R., 64, p. 441) presents in a like manner general information as to climatic and soil requirements for successful production, preparation and care of the soils, cross-pollinated and hybrid varieties, planting operations, harvesting, uses of stalks for silage, control of disease and insect pests, etc.

New Zealand spinach needs no soaking, C. E. HEIT. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 11 (1945), No. 2, p. 10*).—Studies with the seed of the New Zealand spinach (*Tetragonia expansa*) showed that soaking the seeds in warm water prior to planting in the field had no material benefit and the procedure was of doubtful value.

Fertility level for starting tomato seedlings, R. D. SWEET and M. PEECH. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 11 (1945), No. 2, pp. 4-5, illus. 2*).—The poor development of young tomato plants in the seedbed is due often to an excess, rather than a deficiency, of soluble salts. The authors discuss experiments conducted at Ithaca to determine the optimum range of fertility for tomato seedlings and to establish by conductivity measurements the critical amounts of soluble fertilizer salts that can be tolerated by the young plants. As a result the leaders recommend that ordinary field soils be composted at least 1 yr. in advance, or 2 or 3 yr. for sods by mixing 1 part of manure and 5 to 10 parts of field soils.

In general the average field soil composted with a small quantity of manure should receive 4-5 lb. of a 5-10-5 fertilizer or its equivalent to a cubic yard of soil.

The treatment should be modified with relation to the inherent fertility of the soil; thus, when fairly fertile soils are composted with manure, little or no commercial fertilizer should be used.

**"Topping" of tomato plants sometimes advantageous,** C. B. SAYRE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 2, pp. 1, 6-7, illus. 5).—The removal of the terminal bud from young plants at the height of about 4 in. resulted in the early development of strong shoots at the base of each leaf and provided stocky plants that were easier to handle during transplanting to the field and were more productive than long, leggy plants that had not been pruned.

**New methods of applying dusts to fruit trees,** G. L. MACK and J. M. HAMILTON. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 2, pp. 8, 9, illus. 3).—The authors report that the high-velocity, low-volume type of spray-duster has proved especially effective on cherries and peaches. This machine delivers 1 pt. or less of finely atomized liquid per tree. Its construction and operation are discussed.

**The influence of differential fertilization with ammonium sulfate on the chemical composition of McIntosh apple leaves,** D. BOYNTON and O. C. COMPTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 9-17, illus. 4).—Analysis of leaf samples collected in July 1943 from five orchards to which ammonium sulfate was applied in both April 1942 and April 1943 showed that in all but one, the Kappel orchard, the average leaf weight was significantly less from the low than from the high N trees. In the four similar orchards, there was a noticeable difference in 1943 vegetative growth, fruit yield, and leaf color in favor of the high N treatments. Leaf N varied directly with N fertilization in all five orchards, with all differences significant except between the 10 and 5 lb. treatments in the Kappel orchard. In all orchards the average K content of the leaves was increased with a decrease in the amount of applied N. The K differences were, however, statistically significant in only two of the five orchards. In all except the Kappel orchard, the percentage of leaf Mg increased with increasing N fertilization and leaf N. Calcium percentages seemed also to vary directly with N. Phosphorus percentages varied inversely with N treatments in all except the Kappel orchard. A discussion of the findings is presented.

**Potassium-induced magnesium deficiency in the McIntosh apple tree,** D. BOYNTON and A. B. BURRELL. (Cornell Univ.). (*Soil Sci.*, 58 (1944), No. 6, pp. 441-454).—Observations in the Champlain Valley of New York showed that magnesium deficiency leaf blotch was induced in McIntosh trees growing in soil low in exchangeable basis as a result of fertilization for 3 yr. or more with muriate or sulfate of potash. Decrease in leaf Mg and increase in leaf K accompanied the appearance of the symptoms. The orchard results plus accompanying greenhouse studies indicated that the appearance of Mg-deficiency leaf blotch resulted from the competitive effect of K at the root surface or within the tree. The K fertilization also caused increased exchangeable K and decreased exchangeable Mg in surface soil under the trees. Twelve yr. of spraying, chiefly with wettable sulfurs but accompanied by annual applications of ammonium sulfate, caused marked acidification of the soil under some trees affected by Mg-deficiency leaf blotch.

**New materials for delaying fruit abscission of apples,** L. P. BATJER and P. C. MARSH. (U. S. D. A.). (*Science*, 101 (1945), No. 2623, pp. 363-364).—To increase the duration and intensity of hormone spray applications, the action of some hitherto untested compounds was tried; it was found that addition of 0.5 percent Carbowax to naphthaleneacetic acid significantly increased both intensity and duration of the effect. Results with 2,4-dichlorophenoxyacetic acid treatment also offered considerable promise as a means of extending the effective period of fruit-drop sprays.

**Cambium temperatures of peach and apple trees in winter, R. EGGERT.** (N. H. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 33-36).—Readings obtained by the aid of thermocouples installed in the bark of two 17-year-old Northern Spy apple and two peach trees, located on northeast slopes of about 15°, showed that on clear winter days with no wind, the temperature may frequently rise to 60°-80° F. and higher in the cambium on the south side of peach trunks. Under comparable conditions maximum temperatures at the same position on the apple trees were considerably lower, about 60°. Except during periods of falling temperatures, the cambium on the north side of peach and apple trunks was rarely as warm as that of the surrounding air. Painting the trunks white reduced greatly the temperature differentials. Even on the exposed sunny side of apple and peach trees, the cambium beneath white paint was at no time more than 10° warmer than air. During cloudy weather and during darkness, the cambium of both painted and unpainted trees had approximately the same temperature as that of the air.

**Accumulation of nitrogen from different sources by peach trees, A. H. NASHARTY.** (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 5-8, illus. 2).—A number of hitherto unfertilized 17-year-old Phillips Cling peaches growing in a Yolo loam soil at Davis, Calif., were treated on September 25, 1939, with ammonium sulfate, calcium nitrate, and urea to supply 1.6 lb. of actual N in all cases. The appearance of N in the 1-year-old shoots was simultaneous and of the same order of magnitude. The seasonal decline in the N content of leaves was less in fertilized than in unfertilized trees, both in absolute and relative terms during the 10 weeks following bloom. A notable increase in the N content of shoot bark before blossoming suggests extensive upward movement of N before there is appreciable transpiration.

**Small fruit culture in the home garden, W. P. JUNKINS** (*Ohio Sta. Bino. Bul.* 232 (1945), pp. 16-21).—Information is presented on varieties, selection of sites, propagation, planting, cultural care, fertilizers, pruning, training, and harvesting.

**Strawberry varieties old and new, F. M. COE** (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 1, pp. 7, 10, illus. 1).—As a result of station trials there is presented a list of desirable varieties, with comments as to their season of maturity, important characteristics and uses, origin, etc.

**Effect of fertilizers, soil reaction and texture, and plant stand on the performance of strawberries, J. R. COOPER and J. E. VAILE** (*Arkansas Sta. Bul.* 454 (1945), pp. 54+, illus. 4).—Based on a number of studies conducted at several locations and extending over a period of years, recommendations are presented as to various cultural aspects of strawberry production. In general, used soil was as productive as new for growing strawberries when fertility and organic content were maintained.

Profitable increases in yield were obtained from the use of complete fertilizers, and in general the lower the fertility status of the soil, the greater were the returns from the use of fertilizer. Particularly on lighter soils, there were two critical periods each year when fertilizers were most useful (1) after harvest to encourage production of young plants and (2) just prior to blooming to encourage plant growth and full development of flowers. The optimal ratio of N, P, and K in the fertilizer formula varied with soil type. Animal manures were profitable on light sandy soils, but tended to present a weed problem on heavier types. Weather conditions and the amount and seasonal distribution of precipitation were found important. The principal causes of cull fruits were drought, cold weather injury, and delayed picking. Fruit quality was associated closely with vigor of the plants, both inadequate and overgrowth tending to lower the sugar content. Stand of plants was important with respect to yield.

Renovation practices, which removed a portion of the older plants to encourage new plants, reduced yields the subsequent year. Very sandy and very heavy soils

were found less valuable for strawberry production than were those of intermediate texture. A moderately acid to neutral reaction was better than strongly acid or alkaline condition. Mulching was beneficial in reducing winter injury and in protecting the flowers from early spring frosts.

Variations of the Catawba grape, W. K. STEUK (*Ohio. Sta. Bim. Bul.* 232 (1945), pp. 31-33, illus. 2).—A number of variations were observed in the Catawba grape, including a flowerless form, vines with straggly clusters, vines with seedless berries, vines with earlier maturing fruit and greater productivity, etc. Of these only the productive, earlier-maturing strains appeared to be an improvement over the regular Catawba.

The relation of nitrogen absorption to nitrogen content of fruit and leaves in citrus, W. W. JONES, W. P. BITTERS, and A. H. FINCH. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 1-4, illus. 1).—Observations on Marsh grapefruit and Valencia oranges harvested in orchards near Phoenix and Yuma, Ariz., showed no increase in N in mature fruits on the tree following the application of N fertilizer during the winter months. The authors conclude that winter applications of N do not contribute to the deterioration of fruit as it hangs on the trees during the winter and spring months. Apparently N enters the fruit only during its period of growth and development, and after a stage of maturity has been attained which corresponds roughly with "legal maturity" N no longer enters the fruit irrespective of amount applied. It is evident that it is the N which entered the fruit during the preceding summer that is responsible for rapid decline in market grade that is associated with high N nutrition. Further evidence of stability of N content of the fruit was the fact that N was not lost from the fruits during the spring flush of growth as is the case in the leaves.

Effect of season of pruning and number of new shoots on the rate of top regeneration of Valencia orange trees, S. H. CAMERON and R. W. HODGSON. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 18-26, illus. 2).—Experiments on a group of Valencia orange trees planted in 1930, and all developed from buds taken from a single parent tree, showed that trees with an unrestricted number of new shoots regenerate new tops more rapidly than do trees with fewer new shoots. The difference was more pronounced in spring-pruned than in autumn-pruned trees.

The rate and amount of regeneration is apparently influenced in the initial stages by the supply of materials available for growth at the time of pruning and by some unknown factor associated with cyclic growth. Later the size of the leaf area developed appears to assume the dominant role.

La coltivazione del castagno [Cultivation of the chestnut], D. VIGLIANI (*Genova (Genoa): Soc. Anonima Editrice D. Alighieri*, 1943, pp. 132, illus. 51).—A general treatise on the culture of chestnuts in Italy, with a bibliography of 150 references.

Cork oak in the Southeast, H. HOPP (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1944, *SCS-TP-54*, pp. 25+, about 20 illus.).—General information is presented on range of the species, obtaining of planting stock, methods of planting, history of introduction, relation of sites to rate of growth, cultural aspects, light requirements, insect and disease pests, etc.

The cultivated aconites, P. A. MUNZ (*Gentes Herbarum*, 6 (1945), No. 8, pp. 463-506+, illus. 19).—"By virtue of the accumulations from several years of attention to these garden plants, and because of the obvious confusion in names, this study has been undertaken with the hope that the horticulturist may find the correct name for his garden plant and that the botanist may identify the more common wild species." - A brief account of the botanical history of the genus *Aconitum* is given, followed by a key to the species likely to be encountered in cultivation and descriptions of the species and variants. An index to the names of aconites in cultivation is provided.

Hybrid tea roses on trial (*Pennsylvania Sta. Bul.* 464 (1944), Sup. 1, p. 9)—A total of 187 varieties of hybrid tea roses was on trial in the station flats. A mimeographed report of the results of the trials is said to be available upon request to the station.

The flower test garden (*Pennsylvania Sta. Bul.* 464 (1944), Sup. 1, p. 7, illus. 7)—A brief discussion, with illustrations, is presented on the flower tests conducted by the station.

## FORESTRY

Costa Rica—land of forests, W. A. DAYTON (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 3, pp. 43-46, 58, illus. 5).—Possessing an area smaller than West Virginia, Costa Rica has a tree flora more abundant than that of the entire United States and Alaska. This article discusses the important species, the types of forest, and present utilization.

Viability of seeds of *Fraxinus* after storage, L. V. BARTON (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 9, pp. 427-432, illus. 3).—It was found that seeds of *F. pennsylvanica* and *F. excelsior*, with moisture contents of approximately 7 and 10 percent, respectively, may be kept for at least 7 yr. by using sealed containers at 5° C.

A note on the viability of seeds of *maga* (*Montezuma speciosissima*), L. V. BARTON (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 9, pp. 423-426).—The rapid deterioration of *maga* seeds (*M. speciosissima*) after harvest, coupled with the economic importance of the tree for its quality wood, prompted a study of the conditions influencing viability. The life span of the seeds is reduced significantly within 2 weeks under ordinary storage conditions, but when the moisture content was kept as high as 33 percent of the wet weight they were held successfully for a month in sealed storage at 5° C. Drying at laboratory temperature (Yonkers, N. Y.) to approximately 10 percent moisture reduced the germinability of the seeds by half, but permitted retention of this percentage of viability at -5°, 5°, or 20° for at least 6 mo. and possibly longer.

Grundzüge der Forstlichen Wasserhaushaltstechnik (einschliesslich Wildbachverbauung) [The fundamentals of forest water economy technic, including the damming of streams], E. KIRWALD (*Neudamm: J. Neumann*, 1944, pp. 362, illus. 123).

## DISEASES OF PLANTS

The Plant Disease Reporter [March 1 and 7, 1945] (*U. S. Dept. Agr., Plant Disease Rptr.*, 29 (1945), Nos. 7, pp. 185-203; 8, pp. 205-219).

No. 7.—Host-disease check list revision—*Festuca-Holcus* (Gramineae) and *Fimbristylis* (Cyperaceae), by F. Weiss; spread of white pine blister rust during 1944, by J. F. Martin; the dodder vector of woody plant viruses, by E. M. Hildebrand; condition of fruits and vegetables on the New York City piers, by R. C. Cassell; potato storage troubles in South Dakota, by I. W. Tervet; diseases reported on tobacco in Georgia and Louisiana and on sugar beets in California; and pea diseases in the Imperial Valley of California, by W. C. Snyder, J. T. Middleton, and E. W. Bodine (Univ. Calif.).

No. 8.—Lima bean diseases in California, by W. C. Snyder and J. T. Middleton (Calif. Sta.); tobacco diseases in Kentucky in 1944, by W. D. Valleau and E. M. Johnson (Ky. Sta.); diseases of lupine in Georgia and Alabama, by G. M. Stone; a streak disease of corn in California, by N. W. Frazier (Calif. Sta.); fungi found on imported Australian wheat, by F. G. Pollack; powdery mildew of mesquite, by J. A. Stevenson; and further notes on the occurrence of *Septobasidium* spp. in Florida, by A. S. Rhoads.

**Control of plant diseases aided by nursery inspection service**, H. F. SEIFERT (*Ill. Dept. Agr. Ann. Rpt.*, 27 (1944), pp. 146-158, illus. 6).—A report on the activities of the Division of Plant Industry with particular reference to control of Japanese beetles, white pine blister rust, phony peach, peach mosaic, and cankerworms and barberry eradication.

**Razze di piante resistenti e prevenzione delle malattie [Resistant races of plants and the prevention of disease]**, E. CASTELLANI (*Genova (Genoa): Soc. Anonima Editrice D. Alighieri*, 1943, pp. 96, illus. 14).—A general treatment of the subject, including the breeding and selection for resistance and physiological races of pathogens.

**Seed-borne fungi**, J. H. WESTERN (*Nature [London]*, 155 (1945), No. 3924, pp. 36-37).—A brief review of papers presented on October 28, 1944, before the British Mycological Society with special reference to fungi parasitizing seeds of British grasses, the *Phoma lingam* canker of broccoli, clubroot of swedes, and the examination of vegetable and flower seeds intended for export. The importance of seed-borne diseases was stressed in the discussion following presentation of the papers.

**Inoculations with bacteria causing plant disease**, A. J. RIKER, P. A. ARK, C. ELLIOTT, and E. M. HILDEBRAND (*Pure Cult. Study Bact.*, 13 (1945), No. 1, pp. 15).—The presentation of representative inoculation methods includes soil, seed, spray, wound, insect, fungus, and virus inoculation, treatment with bacterial products, and antibody production. Cognate considerations include strain variations, pathogens acting together, cultures from another locality, relative efficiency in technic, antibiotics, records, and interpretation of results. There are 32 references.

**Plant viruses and virus diseases**, F. C. BAWDEN (*Nature [London]*, 155 (1945), No. 3928, pp. 156-158).—"Substance of two lectures at the Royal Institution delivered on November 21 and 28," 1944.

**Selective power in virus transmission exhibited by an aphis**, B. KVÍČALA (*Nature [London]*, 155 (1945), No. 3928, pp. 174-175).—It is reported in this preliminary note that the green peach aphid and the cabbage aphid, when colonized on cauliflower seedlings infected with viruses of cabbage black ring spot (*Brassica virus 1*) and cauliflower mosaic (*Brassica virus 3*), transmit both; *Mysus ornatus* Laing, similarly colonized, picks out the mosaic virus, leaving the black ring spot virus behind.

**The biology of fasciation and its relation to abnormal growth**, O. E. WHITE (*Jour. Hered.*, 36 (1945), No. 1, pp. 11-22, illus. 11).—A general discussion (11 references) of fasciation with respect to its characteristics, distribution in the plant kingdom, origin, heritability, relation to environment, and plant world analogy to cancer.

**Making the best use of a limited supply of Fermate**, D. H. PALMITER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 2, pp. 12-13, illus. 1).—Notes and recommendations based on the station's research as to the best spray combinations and schedules involving use of Fermate for controlling rust of apple and quince, apple scab and fruit spot, and brown rot of sweet cherries.

**Cereal rust situation in the southern plains area**, C. O. JOHNSTON (*U. S. Dept. Agr., Plant Disease Rptr.*, 1945, Sup. 156, pp. 145-146).—Excellent survival and vigor of winter wheat were reported for the area, but no instance in the past 20 yr. is recalled when infections of leaf rust were so widespread and so far advanced by late March. The only other cereal rust now conspicuous in the area is leaf rust of rye.

**Wheat bunt field trials**, G. A. BAKER and F. N. BRIGGS. (Calif. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 2, pp. 127-133, illus. 1).—The mathematical model of wheat bunt (*Tilletia tritici*) field trials constructed and here presented is

believed to be adequate. The mean and spread of the heterozygous plants cannot be observed, but these can be calculated because the means and variances of the percentages for the homozygous and segregating rows can be observed and it can be assumed that the probabilities of infection for different types of plants are perfectly correlated as between rows. This model should help interpret complex hybrids in that the nature of the variances will be better understood. This is particularly true where a row or family is heterozygous or made up of plants of different genotypes and probabilities of infection; it also indicates that the spread of the percentages depends on the length of rows, spread of infectivity levels, and general level of infection. Findings from the mathematical model were applied in detail to extensive genetic data from a cross between Banner Berkeley and Baart wheat varieties, results proving consistent with the assumption that the spreading effect of environment as measured by  $a$  (a factor  $\times$  the binomial standard deviation) is independent of genotype and length of row. This assumption is probably true only for certain ranges of genotypes and lengths of row.

**Forecast of serious wheat leaf rust epiphytotic,** K. S. CHESTER and H. W. LARSH (*U. S. Dept. Agr., Plant Disease Rptr.*, 1945, Sup. 156, pp. 142-144).—The exceptionally favorable late winter and early spring weather have permitted such increase in wheat leaf rust as to render probable a severe epidemic, perhaps equal to that of 1938. The bases of this forecast are discussed in some detail.

**Selenophoma bromigena** leaf spot on *Bromus inermis*, J. L. ALLISON. (Minn. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 4, pp. 233-240, illus. 1).—This fungus—cause of a common leaf spot—was found by inoculation tests to be specific in its attack, producing symptoms only on smooth brome among the many brome and other grasses and cultivated cereals. The disease is of general distribution, occurring wherever smooth brome is grown. It appears in early spring and develops best during periods of moist cool weather. The fungus overwinters in the pycnidial stage and is disseminated by wind, rain, and infected seed; no perfect stage has been found. Specialized races exist in nature, two distinct races having been isolated. Penetration of the host tissues is direct. Since resistant smooth brome plants are common, selection and breeding offer a desirable means of control. There appeared to be some geographical relationship in culture characteristics among single-spore isolates taken from specimens collected at specific localities. Single-spore isolates grew best on potato-dextrose agar at 20°-25° C. and were uniform in their culture characteristics. Occasional cultures produced sectors or variants; these failed to produce pycnidia or conidia and could be perpetuated only by mycelial subtransfers. Variants were stable in culture, remaining constant for 2 yr. through repeated subtransfer; variant type cultures proved nonpathogenic.

The brown leaf spot on *Bromus inermis* caused by *Pyrenophora bromi*, D. W. CHAMBERLAIN and J. L. ALLISON. (Wis. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 35 (1945), No. 4, pp. 241-248, illus. 1).—The cause of this leaf spot was identified as *P. bromi*; host range studies demonstrated it to be specific to *B. inermis*, but there were indications of differences in disease reaction among inbred lines in Wisconsin. The fungus overwinters in the perithecial stage. Ascospores are the important inoculum, conidia being fragile, sparsely produced, and short-lived. Both spore forms germinated at 4°-32° C., the optimum for ascospore germination being 20° and that for conidia 28°. The fungus is homothallic. The ascigerous stage was repeatedly produced by subjecting single-ascospore cultures to low temperatures for 3 mo. *P. bromi* invades the host by direct penetration of the leaf epidermis and ramifies intercellularly in the leaf tissues. Development of the disease is favored by cool weather and abundant moisture.

**Alternaria ricini** (Yoshii) Hansford, the cause of a serious disease of the castor-bean plant (*Ricinus communis* L.) in the United States, E. C. STEVENSON. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 4, pp. 249-256, illus. 4).—This

Disease of castor-beans is described and the cause determined to be *A. ricini*, the taxonomy of which is discussed. The fungus causes a leaf spot and diseased conditions in the seedlings and racemes. It is seed-borne and has been identified on castor-bean capsules from Texas, Louisiana, Mississippi, Georgia, South Carolina, Tennessee, Kentucky, and Arkansas. No means of control have been developed, but there appears to be some promise that seed treatment will control the seedling phase.

Remedial measures for tirak in Punjab-American cottons, R. H. DASTUR (*Indian Farming*, 5 (1944), No. 6, pp. 254-258).—These cottons in the Punjab are said to suffer from a physiological trouble commonly known there as "tirak" or "bad opening" of the bolls, which has been studied over an 8-yr. period. The leaves turn yellow and are shed or they droop before shedding; the bolls—which remain small—crack before maturity. The trouble develops following a deficiency of nutrients—especially N—or of water as the crop enters the fruiting phase. Cotton suffers from water deficiency in soils where there is an abnormal amount of harmful salts in the subsoil; if then the weather conditions during the fruiting months are unusually dry and warm continuously for a number of days, water starvation ensues and the intensity of the trouble increases. Late sowing of the seed (in June rather than May) was found a common measure suitable for control on all soil types; also by closer planting of the June-sown crop much less damage from jassids followed. Detailed recommendations are given.

A "false" browning reaction to rust (*Melampsora lini*) infection in flax, C. R. MILLIKAN (*Jour. Dept. Agr. Victoria*, 43 (1945), No. 2, pp. 83-92, illus. 10).—A false browning disease differing from that due to *Polyspora lini* is reported to have occurred in flax crops in Victoria in early November of each of the three seasons—1942-44. This trouble was found associated with a heavy infection of immature abortive rust uredospore pustules (*M. lini*); attempts to isolate a causal organism from the spontaneous false browning lesions failed. Lesions identical in appearance were produced around the rust pustules on leaves and stems of two flax varieties by subjecting them to a constant temperature of 37° C. and a relative humidity of about 85 percent for periods ranging up to 30 hr.; the heat treatment, however, had no effect on the uninfected tissues. Histological studies showed the tissues to be similar in appearance in both the artificially heated and the spontaneous lesions; the browning was due to the necrosis of the cells in the affected area associated with a dense mycelial infection, the rust mycelium extending for a considerable distance beyond the point of infection. The rust pustules were abortive, and were usually devoid of uredospores. In the tissues of the heated and spontaneously occurring leaf lesions the hyphal tips were swollen to form miniature bodies which, except for size, resembled uredospores or teliospores; no such bodies were detected in normal rust-infected leaf tissues.

A technic for measuring ergot resistance in *Paspalum* species, G. W. BURTON. (U. S. D. A. and Ga. and Ga. Coastal Plain Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 2, pp. 160-162).—The procedure consists in plating 100 heavy florets containing caryopses or ergots in a test tube with approximately 4 cc. of technical 66%  $H_2SO_4$  and shaking 20 such samples in a test tube shaker for 35 min. to remove the palea and lemma, following which the remaining caryopses and ergots are washed free of acid and dried. The number of caryopses, now easily counted, subtracted from 100 gives the percentage of ergots in the sample. In 1943 this technic was used to determine the ergot percentage in seed from 960 spaced plants of Dallis grass, the constituents of a test of 24 strains arranged in 4-plant family rows replicated 10 times. The mean ergot percentages for the 24 strains (each mean the average of the ergot analyses of 40 plants) ranged from 25.9 to 70.4. A mean difference of 7.5 percent was required for  $P = 0.05$ .

**Viruses, virus diseases, and similar maladies of potatoes (*Solanum tuberosum* L.).** F. WEISS ET AL. (*U. S. Dept. Agr., Plant Disease Rpt.*, 1945, Sup. 155, pp. 81-140).—This is the third section of the descriptive list of plant viruses being compiled under the auspices of the Subcommittee on Potato Viruses of the Committee on Virus Classification and Nomenclature, American Phytopathological Society, preceding sections having been noted (E. S. R., 93, p. 45). Aside from the scientific interest in the nomenclature of the viruses commonly associated with potatoes, there is a large economic concern in the diseases which these and other viruses cause in this crop. Because of the diversity of names applied to potato viruses in different countries and by different investigators, the problem of classifying such information has been difficult. An attempt has therefore been made in part 2 to assemble and classify the names of all virus and viruslike diseases of potatoes that are found in the readily accessible literature. This treatment comprises (1) a statement of the cause of each disease insofar as the available information permits, (2) the designation of a common name under which—for purposes of records and indexes—information pertaining to each is filed, and (3) a listing of names believed to be synonymous or equivalent that are used in the United States or other countries.

**Importance of potato virus X in the growing of potatoes,** K. M. SMITH and R. MARKHAM (*Nature [London]*, 155 (1945), No. 3924, pp. 38-39).—Virus diseases are estimated to cause a loss in Great Britain of a million tons of potatoes annually; there are three viruses of importance in these losses—leaf roll and severe and mild mosaics. The first two are aphid-transmitted and infrequent in the best seed-growing areas of Scotland, where the vector is uncommon; the virus X—cause of mild mosaic—is difficult or impossible to determine by inspection alone and is present in a very high proportion of Scotch seed potatoes, including certified stock. Nucleus stocks of all the commercially popular potato varieties are being grown in insectproof greenhouses and rigorously tested for virus infection each year; some 12 of these are being increased in the best seed potato districts of Northern Ireland, followed by planting in still greater isolation on an island. Though the effects of mild mosaic are comparatively small, careful tests showed a 12-percent reduction in yield by infected as compared with healthy plants. Gradual replacement of the X-infected stock seed appears to be in order.

**Reliability of the stem-ooze test for field identification of potato ring rot,** L. C. KNORR. (*Cornell Univ. Amer. Potato Jour.*, 22 (1945), No. 3, pp. 57-62).—Field diagnosis of bacterial ring rot is complicated by other vine disturbances; a test found serviceable under such conditions consists of cutting a suspected stem near the point of original seed-piece attachment; squeezing the stem at the cut, and looking for a pearly milky viscous exudate at a locus or line between the woody vascular ring and the pith. When plants are infected through the seed piece, the bacteria first occur in the new plant at this point of attachment; only later are the bacteria demonstrable in other parts such as the tubers and aerial vines. In order to determine the degrees of relationship between the presence of ring rot as indicated by the gram stain and the occurrence of external vine wilt and stem ooze, use was made of 432 potato plants of 11 varieties grown under two field environments and planted and harvested at different dates. The percentage of plants correctly diagnosed by external vine symptoms was 85.6; that of disagreement due to few bacteria resulting in positive gram smears but insufficient to induce wilting amounted to 12.8, while the percentage representing erroneous judgment as to what constituted ring-rot wilt was 1.6. The percentage of plants correctly diagnosed by stem-ooze tests was 97.2; that of disagreement due to few bacteria resulting in positive gram smears but insufficient to produce stem ooze amounted to 1.9; while the percentage of erroneous judgment as to what constituted ooze was 0.9.

**Spraying with bordeaux increases potato yields even in dry years,** H. W. THURSTON, JR. (*Pennsylvania Sta. Bul.* 464 (1944), Sup. 1, pp. 6, 9, illus. 2).—

Experiments have been under way since 1941 on the value of new fungicides for potato spraying; among 50 or more tried, most have proved inferior to bordeaux. In the dry season of 1944, neither early nor late blights were factors influencing yields, yet spraying with bordeaux produced the best yields (data tabulated). Furthermore, the rather close correlation between yield and the tipburn index showed the importance of the "tipburn-hopperburn" complex in such seasons; the worst tipburn and the lowest yield among the plots receiving Cu in any form were on those left unsprayed during July.

**Pathological histology of sugarcane affected with chlorotic streak,** E. V. ABBOTT and J. E. SASS. (U. S. D. A. and Iowa State Col.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 6, pp. 201-207, illus. 3).—Some axillary buds from affected stalks showed no histological abnormalities; others exhibited varying degrees of necrosis of epidermis and mesophyll. Development of the characteristic streaks on the leaves resulted in marked reductions in the number, size, and stainability of the chloroplasts. When necrosis developed in these streaks, it was initiated in the mesophyll and involved the vascular bundles only after destruction of mesophyll tissue was far advanced. In diseased leaves with a "scalded" appearance, but lacking the streaks, thickening of the walls and gummosis sometimes occurred in the xylem and phloem before or simultaneously with similar effects in the mesophyll. Necrosis of parenchyma tissue in the stems occurred sporadically. Gummosis of the conductive elements was common, but no other abnormalities were observed in these tissues. The gumlike material may be completely amorphous, exhibit some striation and minute granularity, or become aggregated into spherical globules. Spherical intracellular bodies staining deeply with safranine and iron-alum hematoxylin were found in stems and leaves of diseased plants. Although some of these had a pelliclelike covering resembling a wall, their contents were homogeneous, with no indication of nuclear structure. Accumulations of a gelatinous substance, frequently resembling organized bodies, were observed in the stems of some diseased plants; these were soluble in ether, xylol, dioxane, and chloroform, but not in ethyl alcohol, and stained brilliantly with Sudan III, indicating a fatty nature. The various types of gummosis and the bodies exhibiting some degree of structural organization are believed to be products of the metabolism of diseased plants, rather than causal agents.

**Nota sobre la causa de una enfermedad de la caña Uba conocida con el nombre de enfermedad a rayas (streak disease)** [Note on the cause of a disease of Uba sugarcane known as streak disease], G. C. DYMOND (*Rev. Inst. Defensa Café Costa Rica*, 15 (1945), No. 122, pp. 55-56).

**The control of scurf and stem rot of sweet potatoes,** R. H. DAINES (*Hort. News [N. J. State Hort. Soc.]*, 26 (1945), No. 1, pp. 1692, 1693, illus. 1).—On the basis of the tests reported, it is deemed apparent that Thiosan is worthy of use as a sprout treatment against both diseases, at least in those areas where Improved Semesan Bel causes excessive sprout injury.

**Transmission by insects of a plant virus complex,** K. M. SMITH (*Nature [London]*, 155 (1945), No. 3928, p. 174).—The rosette disease of tobacco is caused by a complex of the vein-distorting and mottle viruses; the former depends on an aphid vector for transmission, whereas the latter is easily transmitted by sap inoculation. In studies of the insect relationships of these viruses, all attempts to transmit the mottle virus by aphid vectors failed unless it was accompanied in the plant by the vein-distorting virus. One experiment with the green peach aphid is detailed to make this point clear. It is suggested that this phenomenon may have a wider application in nature than has been realized, and that possibly other plant viruses apparently not insect-borne when alone can be transmitted in the presence of another virus.

**Immuna II, ny mot klumprotsjuka mycket motståndskraftig stam av rova** [**Immuna II, a new strain of turnip highly resistant to clubroot**], H. LAMPRECHT

and N. HERTZMAN (*Agri Hortique Genetica [Landskrona, Sweden]*, No. 1-2 (1943), pp. 31-33, illus. 1; *Ger. and Eng. abs.*, p. 33).—Breeding work of 10 yr. is reported to have resulted (1936) in the turnip variety Immuna, which proved highly resistant to clubroot but lower in dry matter than Pedigree Bortfelder—the variety commonly grown in Sweden. The improved type—Immuna II, strain No. 26—here described was selected from the cross (Marienlyst V  $\times$  Redheaded Bortfelder)  $\times$  Immuna; its root is similar in shape to Pedigree Bortfelder and in 1939-42 gave at least as high a yield of dry matter as the latter variety.

**"Marsh spot" in beans,** E. J. HEWITT (*Nature [London]*, 155 (1945), No. 3923, pp. 22-23, illus. 1).—This brief report of pot culture tests indicated that whereas peas are very susceptible to Mn deficiency, broadbeans and scarlet runner beans are more resistant. Dwarf beans and haricot beans—which show the most marked leaf symptoms—are most resistant to the marsh spot phase and may remain free from it even when the leaf symptoms are very severe.

**Sweet corn variety test, 1944** (*New Jersey Sta. Plant Disease Notes*, 22 (1945), No. 2, pp. 5-6+).—In the 1944 tests (E. S. R., 91, p. 303) 43 entries were used, and the results are tabulated and discussed. The disease data are believed reliable, and several points with regard to both bacterial wilt and smut are considered significant.

**Acrothecium leaf spot of Basella rubra L.**, L. A. ALVAREZ GARCIA (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 27 (1943), No. 4, pp. 149-164, illus. 8; *Span. abs.*, pp. 163-164).—A leaf spot of red vinespinach (*B. rubra*) not previously recognized in Puerto Rico—or probably elsewhere as a parasite of this host—is described and attributed to *A. basellae*. The fungus produced leaf lesions in 5-7 days after inoculation with conidia from pure cultures; vine lesions took longer to develop. Atmospheric humidity accompanied by relatively high temperatures favored infection as shown by pathogenicity tests under both greenhouse and field conditions; the foliage of heavily infected plants became blighted under these conditions and unfit for consumption. Weekly spraying with bordeaux (3-3-50 or 4-4-50) proved satisfactory in controlling the disease, the latter formula giving the better results under persistent humidity.

**Studies on tomato mosaic in Puerto Rico—a new mosaic disease of tomato,** L. A. ALVAREZ GARCIA and J. ADSUAR (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 27 (1943), No. 4, pp. 141-148, illus. 1; *Span. abs.*, p. 147).—The authors report their demonstration of the pepper mosaic virus in mosaicked tomato plants which results in a characteristic faint yellowish mottling and downward puckering of the leaves. The identity of the virus was substantiated by cross inoculations and by the severe vein necrosis induced in the Large Bell Hot pepper variety. From a discussion of the different types of symptoms encountered it is concluded that the blight and necrosis sometimes associated with this tomato mosaic are probably due either to a single entity or to its interaction with the pepper mosaic virus in this host. Until more is known about the transmission and properties of the tip blight virus found in Puerto Rico, its nature will remain uncertain. The apparent loss of virulence when the tomato mosaic virus is passed consecutively from tomato to tomato or submitted to a long sojourn in either tomato or old pepper plants, as well as its increased infectivity when transferred to tobacco, are phenomena well established for other viruses. Failure to recover the virus entity from dried leaves of affected tobacco plants or from necrotic tomato leaves suggests the possibility of control by cutting affected plants and allowing them to dry *in situ*. As the virus is transmitted mechanically, care should be taken not to spread it while working in the seed beds. Pepper is extensively grown in Puerto Rico and is an important source of the virus.

**Possible black walnut toxicity on tomato and cabbage,** O. A. REINKING. (N. Y. State Expt. Sta.). (*North. Nut Growers Assoc. Ann. Rpt.*, 34 (1943), pp. 56-58, illus. 1).—Observations on two cases of wilting and stunting of plants in the

vicinity of black walnut trees are offered as further circumstantial evidence that such troubles may be caused by the toxicity or antagonism of the tree roots.

Prevention as a means of fire-blight control, E. M. HILDEBRAND. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 2, pp. 9, 10).—Preventive measures are reported to have proved effective in both old and young pear orchards in New York State, success lying in prompt removal of all sources of infection. Most of the information here presented has been detailed in a publication previously referred to (E. S. R., 81, p. 532).

Progress in pear scab control in the Hood River Valley, J. R. KIENHOLZ and L. CHILDS. (U. S. D. A. and Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt.*, 36 (1944), pp. 79-82).—A brief summary of earlier tests showing that copper phosphate and wettable sulfur controlled scab, although the latter caused excessive russet, and of recent tests with some of the new organic fungicides among which Fermate appeared to be promising.

Currant leaf spot control, R. F. SUTT (*New York State Sta. Bul.* 709 (1945), pp. 13, illus. 2).—Leaf spot as it occurs in New York State may be caused by *Pseudopeziza ribis*—the most prevalent organism—or by *Mycosphaerella grossulariae*; it is the most wisely distributed currant disease in the State. Various concentrations of bordeaux, nine insoluble coppers, three organic fungicides, and lime-sulfur have been tested during the past 6 yr. for their efficiency in control; the copper fungicides in general have proved satisfactory, while the organic materials and lime-sulfur have not. Addition of certain spreader-stickers to the bordeaux improved the control; of the eight tested, S. E. C. oil was best, while Spraysoy A and rosin fish oil soap were the only other satisfactory materials. The apparent spray residue on the fruit was reduced to a minimum by use of a low-dosage bordeaux with suitable spreader-sticker. The insoluble coppers did not cause objectionable residues. Preliminary tests with three insoluble copper dusts containing 7 percent Cu did not give satisfactory results. The best control was obtained by two applications of bordeaux 3-3-100 with 1 pt. of S. E. C. oil. The first application was made about June 1, when leaf spot was first observed, and the second in July immediately after harvesting the fruit.

Nutrient deficiencies of citrus, H. D. CHAPMAN, S. M. BROWN, and D. S. RAYNER. (*Calif. Citrus Expt. Sta.*). (*Calif. Citrog.*, 30 (1945), No. 6, pp. 162-163, illus. 2).—A general outline on the mineral element requirements of citrus, with a more detailed account of the causes, effects, and control of iron deficiency. See also an earlier note (E. S. R., 93 p. 48).

Podredumbre de las raicillas de los citros [Citrus root rot], J. C. BERTELLI and L. K. DE BERTELLI ([Uruguay] *Dir. Agron., Notas Fitopatol.* 71 (1944), pp. 23-+, illus. 26; *Eng. abs.*, pp. 20-21).—This reports a general study of a rot of the rootlets, also referred to as "tristeza," reported to have first appeared in the citrus region of Corrientes, Argentina, about 1930 and in 1940 in Uruguay, where this investigation was made. Experimental results appeared to rule out unigenitality between stock and scion or mineral deficiency as causes. The nematode *Tylenchulus semipenetrans* was found causing a weakening of the trees with a symptomatology easily confounded with that of the rootlet decay; however, such trees—unlike those with the root rot—completely recovered after intensive manuring. More recently a depressed girdle was observed just below the union of stock and graft; from this wood a fungus of the genus *Botryodiplodia* or *Lasioidiplodia* was recovered. The possible relation of this fungus or of a virus to the disease is being studied further.

Effect of certain packing house practices on decay, rind breakdown, and juice quality of Florida oranges, J. R. WINSTON and C. L. ROBERTS. (U. S. D. A.). (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 140-144).—The authors report on the

results of a preliminary survey in packing houses and discuss their findings. Contrary to popular belief, there was no indication in any of the lots of fruit that infection in the soaking tank contributed to decay development. Since the amount of decay was not increased by the soaking tank, washing, dyeing, or waxing processes, it is evident that the principal points at which damage occurs leading to infection and decay must be sought elsewhere. The washing, color-adding, ethylene, and waxing treatments given oranges in packing houses considerably increased the rind break-down, all steps appearing to contribute. Decay of gassed or color-added fruit decreased with increased processing, while the amount of decay in fruit which was not colored was unaffected by processing. Juice quality, as judged by total soluble solids, total acid, and vitamin C contents, was not generally affected by washing, dyeing, or lightly waxing the fruit; in a few instances the flavor was definitely impaired.

A report of progress of studies on dusting for the control of walnut blight in Oregon, P. W. MILLER. (U. S. D. A. coop. Oreg. Expt. Sta.). (*Oreg. State Hort Soc. Ann. Rpt.*, 36 (1944), pp. 95, 97, 98).—The dusting tests continued in 1944 are reported upon, with the conclusion that the results thus far are sufficiently promising to warrant trial by interested growers, although further experimentation under a diversity of environmental conditions will be required before it can be definitely stated that a dusting program will give commercial control of the bacterial blight of walnuts under all conditions in Oregon.

*Alternaria* blight of bachelor's button (*Gomphrena globosa* L.), L. A. ALVAREZ GARCIA. (*Jour Agr. Univ. Puerto Rico [Univ. Sta.]*, 27 (1943), No. 4, pp. 165-169; *Span. abs.*, pp. 168-169).—This blight is reported as occurring on *G. globosa* and *G. dispersa*, ornamental varieties as well as the wild type proving susceptible. The disease is recognized by the subcircular yellowish-brown lesions with characteristic reddish halos on stems and leaves. Conidia from both young lesions and oatmeal cultures were used for morphological, physiological, and inoculation studies; conidia from both sources gave successful inoculations. Sporulation was observed on leaf but not on stem lesions; dead plant parts appear to harbor the pathogen. The disease was more severe during hot rainy weather. The causal fungus was identified as *A. gomphrenae*, first reported from Japan.

Mosaic of the common coleus, D. B. CREAGER. (Ill. Nat. Hist. Survey). (*Phytopathology*, 35 (1945), No. 4, pp. 223-229, illus. 2).—Coleus mosaic—causing mottling, splotches, ring spots, oak-leaf patterns, and hieroglyphic markings on leaves—was observed in a number of greenhouse and outside plantings. Grafting tests clearly demonstrated it to be caused by a transmissible virus. Observations in experimental and commercial plantings indicated some natural means of spread, and insects are suggested as the probable vectors. All attempts to transmit the virus mechanically have failed.

Rhizoctonia neck rot of gladiolus, D. B. CREAGER. (Ill. Nat. Hist. Survey). (*Phytopathology*, 35 (1945), No. 4, pp. 230-232, illus. 2).—This neck rot and damping-off of gladiolus was observed in Illinois plantings—especially in small plants grown from cormels. Infection occurs in the basal parts of the leaves about an inch below the soil surface, usually destroying the plants in long, continuous sections of the rows. The malady is attributed to a strain of *Rhizoctonia solani*.

Botrytis blight of lilies, C. J. GOULD. (Wash. State Col.). (*Florists Exch. and Hort. Trade World*, 104 (1945), No. 13, pp. 11, 15, illus. 1).—In the single season's experiment reported upon, Fermate and Dithane gave much less satisfactory control than bordeaux. Penetrol was added to the bordeaux, while other suitable spreader-stickers were used with the organics.

Pathogenicity of the Dutch elm disease fungus, L. J. TYLER and K. G. PARKER. (Cornell Univ.). (*Phytopathology*, 35 (1945), No. 4, pp. 257-261).—In an outdoor

planting, 5-year-old American elms were inoculated (June 19) while actively growing with eight culture races of *Ceratostomella ulmi* originated as sector variants in mass isolates from spontaneously infected elms in southeastern New York. Stock cultures of the fungus were started from single spores. According to the level of pathogenicity exhibited—as determined by severity of foliage wilt and by percentage of tree killed—these races were distributed among three groups; four races were strongly pathogenic and three moderately so, while one was practically nonpathogenic. Maintenance of these races on nutrient agar—without passage through elm during a 7-yr. period—failed to change their virulence appreciably.

### ECONOMIC ZOOLOGY—ENTOMOLOGY

[Louisiana animals] (*La. Acad. Sci. Proc.*, 8 (1944), pp. 47-73, 77-82, illus. 5).—The following articles are included: Distribution of Certain Cold-Blooded Animals in Louisiana in Relationship to the Geology and Physiography of the State, by P. Viosca, Jr. (pp. 47-62); and Distribution of Louisiana Mammals With Respect to the Physiography of the State, by G. H. Lowery, Jr. (pp. 63-73) and Blood Parasites of Louisiana Birds, by W. W. Wirth (pp. 77-82) (both La. State Univ.).

[Notes on various mammals] (*Jour. Mammal.*, 26 (1945), No. 1, pp. 87-88, 89, 91-92, 94, 95-96).—The following are included: Some Winter Foods of the Cottontail in Southern Michigan, by L. R. Dice; Another Record of the Badger as a Highway Casualty, by R. W. Dexter; Additional Records of Badgers Killed on Highways, by W. B. Davis; Red Fox Breeding in Salt Marsh, by A. L. Nelson, C. Cottam, and W. S. Bourn; Speed and Endurance of the Coyote, by C. Cottam; and The Genus *Peromyscus* in West Virginia, by L. W. Wilson.

Notes on coyote food habits in Montana and British Columbia, O. J. MURIE (*Jour. Mammal.*, 26 (1945), No. 1, pp. 33-40).—By way of summarizing the results of his observations, the author states that the coyote usually seeks an abundant animal form whose habits are such that it lends itself to easy capture on a scale large enough to furnish a staple food supply; it is alert for any opportunity to pick up other species—vertebrate or invertebrate; and it seeks the areas of big game concentrations, especially in winter, on a chance of picking up carrion or finding an animal at a disadvantage. From the economic standpoint, it can be expected that as livestock become easily available, especially when natural food fails, the coyote will readily take advantage of the opportunity; this could be expected in the North when the snowshoe hares fail and domestic sheep herds are present. The subject of coyote food habits thus becomes a local problem, either from the economic or pure science standpoints according to the ecological picture.

Mountain lion trapping, S. P. YOUNG (*U. S. Dept. Int., Fish and Wildlife Serv. Cir.* 6 (1945), pp. 7+, illus. 4).—On the food habits and control by hunting, poisoning, and trapping.

Pelage changes in the snowshoe hare (*Lepus americanus struthopus* Bangs), J. H. SEVERAID. (Univ. Maine et al.). (*Jour. Mammal.*, 26 (1945), No. 1, pp. 41-63, illus. 16).—This discussion on periodical color changes is based on observations of animals penned under conditions giving excellent opportunities to note all changes. The results agreed closely with those of previous workers regarding the manner of the pelage changes, but an attempt is here made to establish seven distinct steps or phases through which the process normally progresses during both the vernal molt and its exact reverse, the autumnal molt. In the latitude of Maine the pelage changes appear to be controlled more by the time of year than by environmental conditions. The beginning of the autumnal change becomes first noticeable late in September and is usually completed by the first of the year. The vernal change begins in March and is about 90 percent completed within 50 days. Clipping and plucking experiments

indicated that this species is capable of regenerating new hair at any time in an area where it is lost, but the growth must be instigated by loss of the old hair roots unless the animal's hair is already in the process of change. The new hair so grown always has the same characteristics as the rest of the pelage or those toward which the pelage is tending at the time the new hair begins to grow. As a result of this study the "monoseasonal" theory of hair growth is advanced for this species, viz., that there are two sets of roots each with its respective active and dormant period of activity; one set gives rise to the vernal brown pelage and the other to the autumnal white pelage and heavier underfur. It is believed that the factors instigating the pelage changes are complex, and that heredity, physiology, and perhaps environmental factors all play a role; any one of them if abnormal can effectively prevent a normal pelage change. The data appear to indicate that, irrespective of how the white color is attained, the winter pelage constitutes a new growth.

**Seasonal and daily activities of the Columbian ground squirrel at Pullman, Washington,** W. T. SHAW (*Ecology*, 26 (1945), No. 1, pp. 74-84, illus. 1).—The activities of this diurnal and sun-loving species were found largely controlled by seasonal and daily conditions of the sun, wind, temperature, drought, and climatic conditions generally. The activities of estivation and hibernation were rather clearly related to sex; in coming from hibernation individuals appear in the order of adult ♂ first, adult ♀ next, with the young of the previous season following. Adult ♂♂ were the last to return to estivation. Daily appearance from dens in the morning and return in the evening was markedly influenced by sunrise and sunset. Seasonal activities were clearly influenced by differences in altitude, animals coming from hibernation earlier in the lower areas; they also returned to estivation sooner in the lower country than at higher altitudes.

**The bobwhite quail in eastern Maryland,** K. A. WILSON and E. A. VAUGHN (*Baltimore 2: Game and Inland Fish Comm. of Md.*, 1944, pp. 138, illus. 61).—"An account of its foods and feedings, movements and territories, predation-mortality and other limiting factors, as well as its management for maintenance and increase, particularly as related to environmental improvement, forestry practice, management cost, and hunting, as demonstrated on the Pocomoke State Forest, Md."

**Fluctuations in wild brown trout populations in Convict Creek, California,** P. R. NEEDHAM, J. W. MOFFETT, and D. W. SLATER (*Jour. Wildlife Mangt.*, 9 (1945), No. 1, pp. 9-25, illus. 1).—Periodic sampling of brown trout populations were made (1939-44) in two sections of Convict Creek, one closed and the other open to fishing; sampling was done by diversion of the water and pumping the pools dry. The two populations were parallel in general trends—apparently cyclic—and highly unstable as to both numbers and pounds of fish present at different times. Natural reproduction contributed an average of 2,750 fish per mile of stream each year. Variable survival conditions rather than number of young produced in any season determined the number of fish that later reached a catchable size. Overwinter losses of all trout, regardless of size, averaged 60 percent and were evidently correlated with winter severity; fish 4 in. and less in length decreased 62 percent and larger trout 80 percent. Reduction in the weight of trout present usually paralleled the reduction in numbers over winter, but there was usually an increase in weight from April to August because of the growth of each incoming class. The fish of each yearly brood decreased about 85 percent in their first 18 mo. of life. The fished section averaged 3,818 trout and 83.3 lb. per mile; the figures for the closed section were 5,438 and 360.3, respectively. If the population of the closed section is assumed to be a maximum natural standing crop, it would be necessary to plant 277 lb. of fish per mile to bring the stock in the open section up to that in the closed section.

Observations on the winter perch population of Lake Mendota, A. D. HASLER. (Univ. Wis.). (*Ecology*, 26 (1945), No. 1, pp. 90-94).

A method for securing stomach contents of live fish, O. H. ROBERTSON (*Ecology*, 26 (1945), No. 1, pp. 95-96, illus. 1).

Crop pests of coastal Peru, P. KNIGHT (U. S. Dept. Agr., *Agr. in Americas*, 5 (1945), No. 3, pp. 50-52, 55, illus. 3).—A practical account.

An all out entomological program, E. O. ESSIG. (Univ. Calif.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 1-8).—This presidential address, presented before the 1944 annual meeting of the American Association of Economic Entomologists, was intended not only as a review of some of the problems now being faced and likely to become even more important during the immediate future and the post-war period, but also as an incentive to interest and action by the membership. The discussion revolved around entomological training, exchange professors, postwar planning—advancement for staff members, relations with the Association of Land Grant Colleges and Experimental Stations, publications, reviews, insect surveys, relations with other organizations, new insecticide testing laboratories, all-out insect control program, plant quarantine, insect extermination, and aid to other countries.

Insect pests of some economic crops in Fiji, R. J. A. W. LEVER (*Bul. Ent. Res.*, 35 (1945), No. 4, pp. 367-377).—The insects are listed under the plants or materials attacked.

[Notes on insects and insecticides] (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 113-128, illus. 4).—Contributions presented (E. S. R., 92, p. 808) are Survival of Anopheline Larvae and Pupae in Muck, by H. F. Schoof, S. C. Schell, and D. F. Ashton (pp. 113-114); *Anopheles walkeri* in Diurnal Shelters in Massachusetts, by R. C. Barnes (p. 114); A United States Record for *Culex interrogator*, by D. C. Thurman, L. J. Ogden, and D. E. Eyles (p. 115); *Anopheles walkeri* in South Carolina, by D. E. Eyles and R. W. Burgess (p. 115); Factors Affecting Survival of Plum Curculio in Peach Orchards (pp. 116-117) and Ground Cover Sprays To Kill Insects and Weeds in Peach Orchards (pp. 117-119), both by H. M. Steiner (Pa. Expt. Sta.); Effectiveness of *Macrocentrus ancylivorus* Reared From Strawberry Leaf Roller in Parasitizing Oriental Fruit Moth, by P. H. Marvin (p. 119), and Sources of Overwintering *Macrocentrus ancylivorus*, by H. W. Allen (pp. 119-120) (both U. S. D. A.); A Chemical Method of Freeing Cocoons of *Macrocentrus ancylivorus* From Tuber Moth Cocoons, by B. R. Bartlett and C. H. Martin (p. 120) (Univ. Calif.); Separating *Macrocentrus* Cocoons From Tuber Moth Pupae, by G. L. Finney (p. 120) (Calif. Citrus Sta.); Seed-Corn Maggots as Pests of Coniferous Seedlings in Western Washington, by E. P. Breakey, C. J. Gould, and C. E. Reynolds (p. 121), and *Phyllocoptes gracilis*, a Pest of Red Raspberry in the Puyallup Valley, by E. P. Breakey (pp. 121-122) (both Wash. Sta.); DDT as a Control for Cherry Fruit Fly (p. 122) and Ground Treatment With DDT To Control Pear Thrips in Soil Under Prune Trees (p. 122), both by S. C. Jones (Oreg. Sta.); Terpin Diacetate as an Activator for Pyrethrum, by R. L. Pierpont (pp. 123-124) (Del. Sta. et al.); Effect of Rotenone and Velsicol (AR-60) Dusts on the Control and Reproduction of Bean Aphids, by Y.-P. Sun (pp. 124-125) (Cornell Univ.); Preliminary Tests With Sabadilla, by E. H. Fisher and W. W. Stanley (pp. 125-126) (Tenn. Sta. et al.); The Larva of *Agonopteryx lecontella*, by S. W. Frost (p. 126) (Pa. State Col.); Some Ectoparasites, Excluding Ixodoidea, of Delaware Mammals, by D. MacCreary (pp. 126-127) (Del. Sta.); Factors Influencing Control of the Walnut Aphid, by A. E. Michelbacher and C. Swanson (pp. 127-128) (Univ. Calif.); and *Cybocephalus* Established in California, by R. J. Bumgardner (p. 128).

Cat willow: A study of the insecticidal value of the cat willow (*Amorpha fruticosa* L.), C. H. BRETT. (Okla. Expt. Sta.). (*Chemurg. Digest*, 3 (1944),

No. 21, pp. 313-314, illus. 2).—A brief preliminary report on studies of the insecticidal properties of this perennial leguminous shrub, the toxic principle of which was found to occur in a brownish viscous substance (referred to as "amorpha") in small blisterlike pustules on the seed pod. The abundance and size of these blisters vary on the pods of different plants and were found to be factors indicative of relative toxicity to insects.

**Soil treatments with special reference to fumigation with D-D mixture,** W. CARTER. (Univ. Hawaii). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 35-41, illus. 5).—This study of soil fumigation was begun because of evidence that as pine-apple soils became older the pathological complex increased in severity and it was clear that some contrary action was necessary if production was to be maintained. A second reason was that first ratoons grown on virgin land and in some cases on land treated with chloropicrin were less susceptible to mealybug wilt than were ratoons on old land. Weed killers as well as various soil amendments proved unsuitable but, among a considerable number of chlorinated compounds, one—a mixture of 1.3 dichloropropene and 1.2 dichloropropane (D-D mixture)—proved to be at least equal to chloropicrin and without any of its disadvantages. D-D mixture can be used effectively without soil cover, is especially effective in nematode-infested soils, and in an area where oriental beetle larvae are important factors in a complex which includes species of *Heterodera* and *Pythium* treatment results in especially significant gains. The 1.3 dichloropropene fraction is evidently the more toxic, but there is a synergism between that compound and other fractions of the mixture which suggests that its combination with other chlorinated substances might furnish a basis for additional research on soil fumigants. Plant growth is seen as the best criterion of the value of a soil fumigant, and it is believed that whatever the effect of the fumigant may be on individual species of the soil complex, the development of good root systems follows effective fumigation.

**Composition of insecticides containing DDT** ([U. S.] Off. Surg. Gen., U. S. Army Med. Dept. Bul. 86 (1945), pp. 13-14).

**Accion del D D T sobre algunos arthropodos domesticos [Action of DDT on some domestic arthropods],** L. VARGAS and R. COLORADO IRIS (*Rev. Soc. Mex. Hist. Nat.*, 5 (1944), No. 3-4, pp. 229-235; Eng. abs., p. 233).—Report of tests on species of *Centruroides*, *Ornithodoros*, *Latrodectus*, *Blatella*, and *Cimex*.

Further studies on the pharmacologic action of 2,2 bis (p-chlorophenyl) 1,1,1 trichlorethane (DDT), M. I. SMITH and E. F. STOHLMAN (*Pub. Health Rpts.* [U. S.], 60 (1945), No. 11, pp. 289-301, illus. 12).—Experiments on the elimination of DDT in the urine in acute and chronic poisoning of rabbits, cats, and of one dog are described, and data are presented on its distribution and storage in some of the tissues of rabbits and cats. Organic chlorine was demonstrated in the urine of rabbits, cats, and dogs receiving DDT long before any symptoms of poisoning could be recognized. Experiments on the circulatory and respiratory responses to some typical drugs and to nerve stimulation in advanced DDT poisoning in cats indicated little deviation from the normal except for a lowered irritability of the peripheral vagi. Studies on the action of a series of hypnotics and related compounds in acute DDT poisoning in rats showed good antidotal effects from urethane and to a lesser degree from dilantin.

**Primer ensayo de importacion de insectos beneficos de Europa a Chile [First trial in the importation of beneficial insects from Europe into Chile],** L. DURAN M. ([Chile] *Agr. Téc.*, 4 (1944), No. 1, pp. 57-58).

**Estudios sobre un pentatomido util, el Apateticus (Podisus) nigro-limbatus Porter** [Studies of a beneficial pentatomid, A. nigro-limbatus Porter], H. PAIROA E. ([Chile] *Agr. Téc.*, 4 (1944), No. 1, pp. 26-37, illus. 5).—A general study including the systematic position (Heteroptera), geographical distribution,

description, biology, and life history of this insect and its beneficial activities as a predator of insects injurious to plants.

Some differences in the physiology and ecology of locusts and grasshoppers, H. G. ANDREWARTHA (*Bul. Ent. Res.*, 35 (1945), No. 4, pp. 379-389).—The known facts concerning the ecology of a number of the more important species of injurious Acrididae are reviewed (47 references); they fall naturally into two groups: (1) The distribution of solitary individuals and of plagues during outbreaks extends over very wide areas with diverse climates; plagues originate in "outbreak areas" which are often more arid than the "invasion areas"; development of plagues in the outbreak area is favored by a cycle of years with above-average rainfall; there is no true diapause in any stage, and with favorable weather there may be several generations in a year; development may be inhibited by dryness, and, particularly, the development of nymphs and maturing of the reproductive organs may be retarded by inadequate atmospheric humidity. (2) The distribution of plagues is restricted to well-defined relatively "narrow" climatic zones; there is no clear distinction between the outbreak area and invasion area, the species being adapted to maintain a relatively high population throughout the area where plagues may occur and plagues developing when the weather favors multiplication of individuals already in that area; plagues usually develop during a cycle of years with subnormal rainfall; there is an obligatory diapause in the egg stage, resulting in only one generation a year; the length of life and fertility of adults may be reduced by inadequate food during a dry period, but there is no evidence that low atmospheric humidity inhibits development. Group 1 includes most of the species that have been recognized as locusts; group 2 includes all the grasshoppers. The phylogeny of diapause may be traced from the primitive condition in the locusts through an intermediate condition in certain grasshoppers to a highly specialized condition in others.

New hypotheses for prediction of the swarming of the desert locust, M. L. ROONWAL (*Bul. Ent. Res.*, 35 (1945), No. 4, pp. 391-393).—Three new hypotheses are briefly summarized, with an appeal to field workers to test them for the desert locust *Schistocerca gregaria* Forsk. and also to ascertain whether hypotheses on similar principles can be used for other locusts with eye stripes, e. g., the Italian locust *Calliptamus italicus* and the red locust *Nomadacris septemfasciata*.

Notas sobre fiebotomidos Mexicanos [Notes on the Phlebotomus species of Mexico], A. DAMPF (*Rev. Soc. Mex. Hist. Nat.*, 5 (1944), No. 3-4, pp. 237-262, illus. 17; *Eng. abs.*, p. 251).—A review of some of the principal contributions (56 references) on the taxonomy and biology of this dipterous group, with descriptions of two new species from Mexico City.

Gustatory rejection thresholds for the larvae of the cecropia moth (*Samia cecropia* (Linn.)), H. FRINGS (*Biol. Bul.*, 88 (1945), No. 1, pp. 37-43, illus. 2).—Rejection thresholds for HCl, CH<sub>3</sub>COOH, NaOH, NaCl, NH<sub>4</sub>Cl, KCl, CaCl<sub>2</sub>, and LiCl, presented as drops of solutions on leaves of the food plant, were determined for caterpillars of this moth. These thresholds for glucose, sucrose, lactose, and strychnine sulfate either do not exist under these conditions, or are higher than the saturation concentrations of solutions of the substances used. The lowest threshold of any tested was for HCl, but CH<sub>3</sub>COOH had a greater stimulative efficiency when it was compared with HCl at the same pH. The threshold for NaOH was higher than that for HCl, indicating that the OH<sup>-</sup> ion is less stimulating than the H<sub>3</sub>O<sup>+</sup> ion. The order of stimulative efficiency for the cations, as chlorides, was NH<sub>4</sub><sup>+</sup> = K<sup>+</sup> > Ca<sup>++</sup> > Na<sup>+</sup> > Li<sup>+</sup>; this is the order of ionic mobilities to which the stimulative efficiencies seem to be related. No conclusions can be drawn with certainty as yet regarding the modalities of taste for these insects.

Control of Mexican bean beetle and corn earworm in the presence of powdery mildew on snap beans, L. W. BRANNON. (U. S. D. A. coop. Va. Truck Expt.

Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 101-102).—Experiments on the fall crop of snap beans in eastern Virginia for controlling the Mexican bean beetle are often complicated by infestations of the corn earworm and the powdery mildew (*Erysiphe polygoni*) disease, the combined effects of the insect and disease attacks on crop production often being severe. Findings from the study reported indicate that in instances where these infestations occur in association with powdery mildew on snap beans, cryolite should be used in preference to derris for the combined control of the two insects and sulfur as a diluent for the dust—or in combination with the spray—in preference to talc or other diluents for its value against mildew. Where the corn earworm is not present a derris-sulfur dust or spray may be substituted for the cryolite.

Origen y dispersion de algunos bruquidos del frijol en Chile [Origin and distribution of some bruchid beetles attacking beans in Chile], G. OLALQUIAGA FAURÉ ([Chile] *Agr. Téc.*, 4 (1944), No. 1, pp. 41-53).—On weevils of the genera *Acanthoscelides* and *Bruchus*, with a bibliography of 25 references.

Comparative effects of spray and dust treatments on European corn borer, D. D. QUESTEL. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 52-56, illus. 3).—This study was undertaken to determine what caused the wide range in control obtained by spray v. dust treatments in field tests over several seasons at Toledo, Ohio.

Laboratory trials indicated that all pyrophyllite dusts containing 0.25-4 percent rotenone as ground derris root caused 100 percent kill of newly hatched larvae when the dusts had not been wetted and dried, but that pyrophyllite without any toxic agent caused higher kills than pure ground derris root containing 4 percent rotenone after both dusts had been wetted and dried. This result appears to have followed because the root powder without pyrophyllite remained caked after wetting, thus permitting the small larvae to crawl freely over the surface, whereas the pyrophyllite tended to return to the powder form when dried and to interfere seriously with the progress of the larvae. Those killed by the pyrophyllite alone are believed to have died from exhaustion and desiccation.

In the field experiment, dissections of the corn plant made in a plot sprayed with derris, in one dusted with derris, and in an untreated plot showed the following results: About 99 and 97 percent of the larvae killed, respectively, by the spray and dust treatments died before reaching the third instar. The spray killed a high percentage of larvae on the outer leaves and in the favorite feeding places of the young borers, such as in the whorl, between leaf and stalk, and in the ear shoots. Although the dust killed nearly as high a percentage on the outer leaves, it was only about half as effective in the more protected locations mentioned and less than a fourth as effective in the tassels. Over twice as many dead larvae were found in the sprayed as in the dusted plot, and over 40 times as many as in the untreated plot. Nearly twice as many larvae were found surviving in the dusted plot, and 6 times as many in the untreated plot as in the sprayed plot. Rainfall appeared to increase the kill caused by the sprays but to reduce it for the dusts. Spray residues remained effective considerably longer than the dust residues.

A new plant insecticide for control of the European corn borer, B. P. PEPPER and L. A. CARRUTH. (N. J. and N. Y. State Expt. Stas.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 59-66).—Ryanex, a new insecticide prepared from the tropical plant *Ryania speciosa*, was subjected to field tests against the European corn borer in New Jersey and New York (1943-44). In preliminary tests in New Jersey the control given was considered the most effective ever attained up to that time. In the New York preliminary tests undiluted Ryanex produced a degree of control outstandingly better than that in nearby plots treated with other insecticides; more extensive tests indicated that a 50-percent Ryanex dust was more effective than

previously used dusts containing nicotine and rotenone—except in one test where control was essentially comparable in the two cases. Spray tests with Ryanex in New York gave a control equal to or better than cube and essentially equal to DDT. Pending further tests, the optimum range of Ryanex concentration in corn borer dust should probably lie between 30 and 50 percent; preliminary estimates indicate that a 50-percent dust can compete in cost with a 1-percent rotenone dust. It was indicated that the later treatments in the normal application schedule may be more necessary than the earlier ones. When 50-percent Ryanex dust was used at various application rates there appeared to be a break in efficiency in New Jersey between the ranges of 20 and 25 lb. per acre per application; though higher dosages reduced borer populations even further, an excellent ear protection was obtained with a dosage as low as 20 lb. per acre. In New York a dosage of 20 lb. per acre was less effective than one of 35 lb. Good control was obtained at the 35- and 50-lb. levels in New York with little difference in effectiveness between these rates, whether or not tillers were present. No appreciable differences were observed in the performance of 40-percent Ryanex dust mixtures prepared with four common diluents. The 50 percent dust applied to commercial plantings with power dusting equipment or with small dusters provided an excellent degree of practical control in New Jersey tests and in preliminary trials in New York.

**On the biology of *Dysdercus howardi* Ballou.—III, The effect of temperature and humidity on the life-cycle, E. I. MACGILL (*Bul. Ent. Res.*, 35 (1945), No. 4, pp. 301-308, illus. 2).**—Further studies (E. S. R., 86, p. 808) indicated the optimum temperature for survival and incubation of eggs in a saturated atmosphere to be about 27° C.; the range for development of the eggs was 19°-32°. Relative humidities of 75 percent and above gave suitable conditions for egg development; 30 percent was lethal. The "threshold of development" for the eggs was considerably lower than the lowest temperature at which they would hatch. The temperature range appeared to be wider and the threshold of development lower at 82 and 75 percent than at 100 percent relative humidity. The degree of absolute humidity and the incubation period were correlated. The length of the life cycle was approximately twice as long at 20° as at 27°; the optimum for the survival of nymphs to reach the adult stage was nearer 27° than 20°.

**Biological races of the pea aphid, C. D. HARRINGTON (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 12-22, illus. 2).**—During 1941-42, aphid collections were received from 12 widely separated pea-growing areas of the United States and tested under uniform greenhouse conditions at Milpitas, Calif., to settle the question of possible biological races. Experiments involving comparative feeding injury, body size, and reproduction rates indicated the pea aphid to be a species complex composed of many races. All data obtained were subjected to appropriate statistical analysis, and on this basis the 31 aphid lines tested were assigned tentatively to 5 separate biological races.

**Properties of petroleum oils in relation to toxicity to potato tuber moth larvae, W. EBELING. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 26-34).**—In tests with the potato tuber worm to ascertain its value for determining the insecticidal effectiveness of oil emulsions, it was found that accurate assays of small differences in toxicity could be made with only 50 larvae per test—divided into 5 lots of 10 individuals each. When 1-cc. portions of oil were poured on disks of paper toweling placed at the bottom of 100-cc. beakers, the larvae deposited thereon became completely covered with an oil film. The period required for 50-percent mortality (M. L. P.) in each beaker was recorded. For practical purposes death was assumed to occur concurrently with the cessation of bodily movements on prodding with a dissecting needle. No oil was found in the intestinal tracts of larvae immersed in stained oil for several hours; it was thus assumed that death had not been hastened by ingestion of the oil. The data presented show the

great differences in M. L. P. obtainable with oil solutions of some of the common insecticides.

There appeared to be no relation between viscosity and distillation range of the regular citrus spray oils and their toxicity to these larvae, but kerosene—which has a much lower viscosity and distillation range and is much more volatile at the experimental temperatures—was found to be more toxic than the spray oils. This result was due to the disappearance of excess kerosene from the larval bodies, a condition found to be conducive to greater insecticidal effectiveness of oils. There was no significant difference in M. L. P. when the larvae were completely immersed in the two liquids. No difference was observed between the toxicity of naphthalene base (western) and paraffin base (eastern) oils. With both types the lower the percentage of unsulfonated residue the greater was the toxicity to these larvae. The unsaturated hydrocarbons also increased the toxicity of spray oils to housefly larvae. It is suggested that the superiority of the paraffin base oils to the naphthalene base oils in their effectiveness against certain insects or their eggs may possibly be due to the physical nature or oxygen permeability of the oil or oil film rather than to the toxicity of itself. It appears from findings by others (16 references) in relation to their effects on insects or insect eggs that the petroleum hydrocarbons removable from spray oil by treatment with  $H_2SO_4$  or by the  $SO_2$  process (1) may increase insecticidal effectiveness, (2) may have apparently no effect because suffocation occurs before toxic action is possible, or (3) may actually reduce the effectiveness of the oil, presumably by an adverse effect on the physical nature of the oil film.

The effect of temperature and dryness on the survival of the eggs of *Calandra oryzae* L. (small strain) and *Rhizopertha dominica* Fab. (Coleoptera), L. C. BIRCH (*Austral. Jour. Expt. Biol. and Med. Sci.*, 22 (1944), No. 4, pp. 265-269, illus. 2).—No eggs of this strain of the rice weevil hatched below  $13^{\circ}$  or above  $34.6^{\circ}$  and none of the lesser grain borer above  $40^{\circ}$  C. The mortality rate for eggs at any one temperature was not proportional to the saturation deficit (s.d.) nor to the product of saturation deficit  $\times$  time (t.). The mortality curves at any one temperature were interpreted as "dosage-mortality" curves by the method of probits; for most temperatures two probit lines were fitted. There was no simple relation between evaporating power of the air and mortality. Differences in temperature as small as  $2^{\circ}$  gave significant differences in mortality when the evaporating power of the air (expressed as a product of s.d.  $\times$  t.) was constant. The relation between temperature (x) and evaporating power (s.d.  $\times$  t.) to give a 50-percent mortality rate for eggs of the rice weevil was given by the parabolic formula s.d.  $\times$  t. =  $8.985 - 0.414x + 0.0057x^2$ ; for eggs of the lesser grain borer, the relation was linear—s.d.  $\times$  t. =  $19.787 - 0.391x$ . For a decrease in temperature of a degree the eggs of the latter withstood an increase in s.d.  $\times$  t. three times as great as that for the rice weevil for the same mortality. At any particular temperature the eggs of the borer withstood much greater desiccation than those of the weevil.

Two strains of *Calandra oryzae* L. (Coleoptera), L. C. BIRCH (*Austral. Jour. Expt. Biol. and Med. Sci.*, 22 (1944), No. 4, pp. 271-275, illus. 2).—The author records two Australian strains of the rice weevil differing significantly in the length of the pronotum and in the length and maximum width of the body. They are described in detail and their physiological reactions are compared. The two strains proved to be intersterile and might be classed as different species.

An improved method for determining the influence of temperature on the rate of development of insect eggs, using eggs of the small strain of *Calandra oryzae* L. (Coleoptera), L. C. BIRCH (*Austral. Jour. Expt. Biol. and Med. Sci.*, 22 (1944), No. 4, pp. 277-283, illus. 3).—The method described and used on the smaller strain of the rice weevil (see above) is based on the hypothesis that the influence of moisture on the development of the eggs of this species at different temperatures is

the same when the eggs lose the same amount of water at these temperatures, i. e., when the product of saturation deficit  $\times$  duration of development  $\times$  factor for air movement is constant; the small interaction between temperature and moisture indicated the procedure to be sound. An apparatus for insuring the circulation of air in a closed jar is also described. The data obtained were analyzed on the transformed logarithmic scale, using the approximate analysis of variance of Yates. Interaction between temperature and moisture was significant when the temperature interval exceeded 9° C.; development occurred in the shortest time (peak temperature) at 32.3°. Logistic curves were fitted to the curves of reciprocal of time to complete development plotted against temperature; a means of testing the goodness of fit of these curves is presented.

**Squash bug depredations in Washington.** R. D. EICHMANN. (Wash. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 110-112).—The squash bug is reported to have been invading central areas of Washington State in outbreak proportions since 1937. Beginning with 1940, observations have been made on the biology, host relationship, and control of the pest; the results are reported upon briefly here. Marblehead—a winter squash—is the main variety grown in the Yakima Valley because it is a high yielder and is also resistant to the western yellow blight; however, the vines succumb readily to squash bug attack, such injury having been termed "anasa wilt of cucurbits." Among the varieties resistant to western yellow blight, Kentucky Field Pumpkin was found to survive squash bug attack best. Summer squashes survive to a considerable extent, largely due to escape by approaching maturity before the bugs appear. Watermelons and cantaloups may also be attacked if preferred varieties of squash are unavailable. Control at present centers around the protection of seedlings from overwintered bugs; various methods are summarized. The problem is to find a material that will maintain protection over a prolonged period. The parasite *Trichopoda pennipes* F. of the Eastern States was introduced during 1943; it remains to be seen whether it can overwinter in Washington and actually prove effective against the squash bug.

**Reproductive capacity of the hessian fly.** H. H. WALKDEN. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 56-58).—The numbers of eggs in hessian flies from the hard-winter-wheat and the western part of the soft-winter-wheat areas of the United States were determined by dissecting freshly emerged ♀♀ from various localities and broods over a 5-yr. period. The abdominal volumes of 641 adults were computed and found to average 0.96 cu. mm.—ranging from 0.12 to 2.12 cu. mm. The number of eggs per ♀ containing eggs ranged from 25 to 388; there was a positive correlation between the number of eggs per ♀ and the volume of the abdomen. Spring-generation flies had a slightly greater reproductive capacity than those of the fall generation. There was a definite tendency toward a lower egg capacity in flies from these areas than in those examined from the soft-winter-wheat area of Pennsylvania.

[**Insecticides in the control of orchard insects**] (*Wash. State Hort. Assoc. Proc.*, 40 (1944), pp. 11-17, 57-71, 113-115, 149-153).—The following brief papers are included: The Avoidance of Bee Poisoning, by J. E. Eckert (pp. 11-17) (Univ. Calif.); Dinitro-o-cresol Trunk Spray Against Overwintering Codling Moth Larvae, by M. A. Yothers and F. W. Carlson (pp. 57-59) and Methods of Making a Concentrated Trunk Spray for Destroying Codling Moth Larvae, by F. W. Carlson and M. A. Yothers (pp. 60-61) (both U. S. D. A.); Experiments in Recent Studies of Codling Moth Control, by W. J. O'Neill (pp. 62-65), Planning a Spray Program for Mites, by R. L. Webster (pp. 66-71), and Cherry Fruitfly Control for 1945, by L. G. Smith (pp. 113-115) (all Wash. Expt. Sta.); and Pear Psylla Control in 1944, by L. G. Davis (pp. 149-153) (U. S. D. A.).

**Insecticide DDT for fruit insect control.** B. A. PORTER. (U. S. D. A.). (*Amer. Fruit Grower*, 65 (1945), No. 3, pp. 14, 33-34).

**The use of cryolite sprays and their removal**, W. J. O'NEILL and K. C. WALKER. (Wash. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt.*, 36 (1944), pp. 60-65).—A brief summary of the results of experiments employing cryolite and lead arsenate in comparable tests for codling moth control during 1940-44.

**Gambrus stokesii** Cam., an Australian parasite of codling moth and oriental fruit moth, G. J. HAEUSSLER. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 103-106).—From 201 cocoons of this parasite received from Australia in March 1938, a total emergence of 138 adults—of which 31 were ♀♀—was obtained during March 29-April 14. Previous attempts to propagate this parasite on the oriental fruit moth at Moorestown, N. J.—following small importations—had been unsatisfactory because of the very unfavorable ratio of ♀♀ produced. Observations on the development and habits of the parasite in the laboratory and a discussion of the results from experimental and routine breeding work during 1938-39 are presented here. The ♀♀ oviposited readily in cocoons containing pupae of either the codling moth or the oriental fruit moth, but showed a definite preference for the former. The newly hatched larva of *G. stokesii* is cannibalistic, so that it is necessary to isolate the eggs prior to hatching when breeding this species in the laboratory. The life cycle was completed on different hosts at about 80° F. in 13-24 days; usually the development of the ♀ was slightly slower than that of the ♂. The evidence is that this parasite probably hibernates as a mature larva. With a single exception, a decidedly greater percentage of ♀ parasites developed from eggs deposited on cocoons containing codling moth pupae than from those containing oriental fruit moth pupae. Results of the breeding tests indicate, however, that the sex of the progeny is apparently fixed at the time the egg is deposited in the host cocoon. A total of 2,585 ♀♀ of *G. stokesii* had been released by the end of 1939 in 31 colonies placed in 27 localities of 13 States, most of the colonies being placed either in orchards with peach and apple interplanted or at points where peach and apple plantings adjoined. No attempts have thus far been made to determine the establishment of the parasite.

**Studies on the Mexican fruitfly known as *Anastrepha fraterculus***, E. W. BAKER. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 95-100, illus. 6).—*A. fraterculus* (Wied.) is found in the States of Veracruz, Morelos, Tamaulipas, and Coahuila, Mex., in rose apples, guavas, peaches, and tropical almonds. Because of the potential danger to the United States and of the differences between the Mexican and South American forms, these biological studies were undertaken. In the laboratory, grapes and coffee berries appeared to be favored hosts for oviposition without larval development, whereas peach, jobo, pear, guava, loquat, and plum were readily infested. In diet tests with adults, sugar and water proved sufficient for life, but for the acceleration of egg development added protein was necessary. The first mating was seen on the sixteenth day; the first eggs were laid on the twentieth. The incubation period for eggs ranged from 50 hr. at 30° C. to 239 at 15°; at 32.5°, 55.5 hr. were required. Larval duration in plum sections ranged from 10 days at 27.5° to 21 at 17.5°; at 30° the shortest time was 10.5 days. Pupal duration ranged from 10.5 days at 30° to 35 at 17.5°. The total developmental period ranged from 26.93 days at 27.5° to 67.5 at 17.5°; at 30° this required 28.06 days. Some flies were alive at the end of 8 mo.

**The codling moth becomes a Statewide problem**, S. W. HARMAN. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Sta.],* 11 (1945), No. 2, pp. 3, 4).—A practical account.

**The important peach insects in Tennessee**, S. MARCOVITCH and W. W. STANLEY (*Tennessee Sta. Bul.* 195 (1945), pp. 23, illus. 18).—Plum curculio, oriental fruit moth, peachtree borer, and San Jose scale are the most important insect pests of peaches in Tennessee. Terrapin scale, shot-hole borer, and the lesser peachtree

borer *Aegeria pictipes* are of somewhat lesser importance. Each of these insects is discussed from the viewpoint of life history, injury, and control under Tennessee conditions. A practical peach spray program is suggested for Tennessee peach growers.

**El periquito del aguacate [A tree hopper attacking the avocado], A. ARGOTE CAMACHO (*Fitófilo*, 3 (1944), No. 4, pp. 3-54, illus. 9).**—This is a general study of *Metcalfieldia (Hoplophorion) monogramma* as a pest of the Mexican avocado, including its systematic position, morphology and general description, biology, physiology, life history, habits, and control.

**Citrus thrips control, C. O. PERSING.** (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 30 (1945), No. 5, p. 144, illus. 1).—The 1944 field studies revealed several new materials offering promise for control, but none was used extensively enough to warrant its recommendation for the 1945 season; one of the most promising was DDT. General and specific suggestions for control are presented, based on present knowledge of insecticides and their availability.

**Dusting for filbert worm control, B. G. THOMPSON.** (Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt.*, 36 (1944), pp. 113-117).—Following a brief history of the filbert worm and its parasites in Oregon, the results of the 1944 dusting tests are briefly summarized. The worm population was found much lighter than for several years. The dusting showed much better results than the spraying, but additional seasons' results under varying conditions must be had before definite comparisons can be made.

**Effect of *Lygus* spp. on seed production and growth of guayule in California, V. E. ROMNEY, G. T. YORK, and T. P. CASSIDY.** (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 45-50, illus. 2).—Under irrigation in California, guayule remains in flower from early spring to late fall and was found to be a very favorable breeding host for several species of plant bugs, the most important of which are *L. sallaei* Stål and *L. hesperus* Knight. The latter occurs throughout the extensive guayule plantings in the central and northern parts of the State; the former is found only along the coastal areas. Under cages *L. hesperus* reduced the weight and viability of guayule seed, and in the field the quality of the seed was lowered. It was demonstrated in cages that as long as seeds of predough stage were available the insect sucked their contents, but when these were lacking it fed on the current season's shoots, resulting in inhibition of subsequent growth and flowering. *L. sallaei* feeds primarily on the terminal growth, causing the plants to appear yellowed and stunted as though diseased. When these insects were removed from damaged guayule, the plants resumed normal growth after several months, indicating that no disease was present but that the injury was due to the feeding of the insect.

**The role of arsenicals in reducing *Lygus* injury to guayule seed, T. P. CASSIDY, V. E. ROMNEY, and G. T. YORK.** (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 50-51).—In tests with sulfur, calcium arsenate, cryolite, and sulfur-arsenical mixtures near Salinas, Calif., there was no significant difference among treatments in the reduction of nymphal numbers in the plots given sulfur or the sulfur-arsenical mixtures; as to seed quality, however, it was found that seed from these plots was of significantly higher viability than that from the cryolite-treated or control plots. It would appear a plausible explanation that the food requirement of those bugs surviving the arsenical or arsenical-sulfur treatments was reduced because they obtained enough poison to cause loss of appetite but not enough to be lethal. This information may also explain why these insecticides have given better results on cotton than the reduced hemipterous populations would have suggested.

**Las cuncunas de los pinos, un problema de entomología forestal [Caterpillars attacking pines, a problem of forest entomology], L. DURAN M.** ([Chile] Agr.

Téc., 4 (1944), No. 1, pp. 17–25, illus. 6).—With special reference to *Macromphalia dedecora* Feitsch (Lep.: Lasiocampidae) and *Dirphia amphimone* (F.) Berg. (Lep.: Saturnidae) and their control by direct mechanical methods, biological methods, and by direct and indirect chemical methods.

Some trials with methyl bromide as a fumigant for rodents in cold storages, F. W. SOUTHWICK, F. B. SCHULER, and G. N. ALPAUGH. (Univ. Conn. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 136–140).—Laboratory and storage room tests were made on white rats, the pine mouse, and wild rats. The kill increased with the concentration of fumigant but not directly proportional to it; ♂ rats were usually more resistant than the ♀♀. In the storage room, some circulation of air was found necessary to prevent stratification of the fumigant and insure the most rapid rate of kill throughout the chamber. Although it appears that methyl bromide is sufficiently "safe" for use on many fruits, complete details are not yet available as to its influence on stored apples.

Methyl bromide as a fumigant for rats and mice in apple cold storages, R. M. BORG and L. SOUTHWICK. (Mass. Expt. Sta. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 146–150).—Tests of this fumigant in an apple storage room indicated it to be very effective in killing these rodents without observable injury or other effect on the fruit. A good dosage appeared to be 0.25 lb. to 1,000 cu. ft. of storage space for 4 hr., or possibly 0.5 lb. for a 2-hr. period. It should be remembered that in a well-filled room, the "space" may be reduced as much as half, thus lowering the actual weight of gas required for a standard dosage; also that methyl bromide is injurious to man as well as animals.

The Histeridae associated with stored products, H. E. HINTON (*Bul. Ent. Res.*, 35 (1945), No. 4, pp. 309–340, illus. 56).—Fourteen species of the family have been found in various parts of the world in stored food or in buildings used to store dry animal or plant products. Keys to the adults and larvae and discussions of the characters, biology, ecology, and economic status of these insects are presented, and summaries of the distribution and habits of the 10 more important species are given. An attempt has also been made to define the family as regards both larvae and adults. There are 41 references.

The larvae of the Ptinidae associated with stored products, S. M. MANTON (*Bul. Ent. Res.*, 35 (1945), No. 4, pp. 341–365, illus. 69).—Much attention has been given to beetles of this family because of the serious losses they cause to stored products, particularly cereals. Keys distinguish the larvae from those of related families and identify the mature or nearly mature larvae of 12 of the 15 species which have been recorded as attacking stored products or having been found in buildings where such products are normally kept. The introduction to the contribution is by H. E. Hinton.

Relation of insect damage to thiamine content of biscuits, B. N. SMALLMAN (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 106–110, illus. 4).—This study was undertaken to determine the nature of the deficiency in army ration type biscuits rendering them resistant to the confused flour beetle. Flour was modified—as in the process of biscuit-making—first by baking it as a flour-water paste, then by baking as a paste containing the baking soda component of the biscuit formula. The growth, oviposition, and feeding on these materials and on the complete biscuits containing 2 and 12 percent fat was determined and related to changes in the thiamine content induced by the baking process. Baking the flour—especially when made alkaline by baking soda—resulted in the destruction of thiamine and in a marked reduction in ability to support the normal growth and reproduction of these insects. Growth of molds on the biscuits brought an increase in reproduction. Besides its adverse effect on the thiamine deficiency, the fat content of the biscuits was also apparently unfavorable to the flour beetles.

**Medical entomology meets the impact of war**, W. B. HERMS. (Univ. Calif.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 8-11).—Entomologists now commissioned in the medical departments of the armed forces and the Public Health Service are reported to be doing an excellent wartime job and to be gaining approval in military circles. The title "medical entomologist" is being more widely used and more generally recognized as a distinctive profession. Wartime experience has demonstrated the value of breadth of training as set forth in an adequate curriculum of medical entomology. Greater stress must be placed on field experience as an integral part of such training. The impact of war shows the need for greater stress on taxonomic and systematic knowledge, as well as on ecology and host-parasite relationships as a basis for intelligent and economical control of vector species. The geography of disease as pertaining to arthropod-borne infections also needs greater emphasis in training curricula. Teachers of medical entomology greatly need tropical field experience. There should be many experienced young men ready for positions in the field of medical entomology and parasitology at the close of World War II. The author has drawn on his long experiences in teaching and in the armed service during World War I in this discussion.

**Laboratory studies on the bionomics of the rat fleas *Xenopsylla brasiliensis* Baker and *X. cheopis* Roths.—I**, Certain effects of light, temperature, and humidity on the rate of development and on adult longevity, E. B. EDNEY (*Bul. Ent. Res.*, 35 (1945), No. 4, pp. 399-416, illus. 2).—The effects of light on adult longevity and on the duration of preadult stages and the effects of psychrometric conditions during preadult stages on adult longevity were investigated for these two species of fleas; in none of the tests was a significant difference found between them. Light slightly reduced the longevity of unfed wild-caught and laboratory-bred adults; it also considerably reduced the duration of all preadult stages—these results possibly due to radiant heat. When fleas were anesthetized while being removed from their hosts, the mean longevity was significantly reduced. Wild-caught ♀♀ lived longer than ♂♂, the cocoon stage of ♀♀ was shorter than that of ♂♂ under all conditions used, and newly emerged unfed adults exhibited no differences in longevity between the sexes. Eggs failed to develop at 24° C. when the saturation deficiency was 10 mm. Hg or over; below this, saturation deficiency had little or no effect on the duration of the egg stage. At 80 percent relative humidity all the preadult stages were shorter at 35° than at 24°. When all adults were kept under the same conditions those resulting from preadults kept at the higher temperature lived for a shorter time than those resulting from preadults kept at the lower temperature. At 24° the larval period increased from 12.4 to 25.1 days as the saturation deficiency increased from 2.3 to 8.8 mm. Hg, but this range of saturation deficiency had no effect on the duration of the cocoon stage. Saturation deficiency during the prepupal stage was shown to bear a linear relationship to adult longevity. Results by previous workers are discussed in the light of the present findings, and a possible explanation is suggested for certain discrepancies that still exist.

**Experimental use of gas condensate for the prevention of fly breeding**, S. W. SIMMONS and W. E. DOVE. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 23-25).—Gas condensate is a byproduct of the manufacture of cooking and heating gas; some plants produce both a light and a heavy fraction. The light fraction combined with No. 2 fuel oil, or a mixture of both fractions, is shown to be very toxic to the immature stages of stableflies and houseflies; its use is suggested as a cheap method of controlling these pests under certain conditions. The condensate might also prove of value in certain types of operations in sand fly and mosquito control; when impregnated sawdust was distributed on water, a good spread and surface film were obtained.

**DDT in fly control** (*[U. S.] Off. Surg. Gen., U. S. Army Med. Dept. Bul.* 86, 1945), p. 15).

**Some experiments on flight range of *Anopheles culicifacies***, P. F. RUSSELL, F. W. KNIFE, T. RAMACHANDRA RAO, and P. PUTNAM (*Jour. Expt. Zool.*, 97 (1944), No. 2, pp. 135-163, illus. 13).—Nine flight tests with dusted *A. culicifacies* involving a total of 207,800 mosquitoes were made during July 22-October 28, 1941, in southwestern India, with 80 calf-baited traps as collecting stations. The total observed flight range was 1.5-1.75 miles; 9 specimens made this flight in a single night, 7 others made it in two nights, and three of the flights were against the wind. It was found from a statistical analysis of the results that the observed dispersion never achieved that postulated; it is thus concluded that inhibiting factors prevented the attainment of anything like a random distribution of flight ranges. Mosquitoes swept with the wind were less widely dispersed than those flying across or against the wind. Wild mosquitoes flew greater distances than those bred in the laboratory. Although the effect of flight-inhibiting factors was specifically defined for the various groups of anophelines recaptured, there was no surety that it would be maintained very far beyond the 1-mile limit. Because of the wide fluctuations in the observed captures, estimates based on the equations presented for distances within the 1-mile zone are subject to a considerable standard error. Decisions as to the extent of antimosquito activities in the vicinity of anophelles breeding areas must be based on the flight potentialities of ♀♀ and on the various factors influencing them. Effective flight range leading to transmission of malaria—as here defined—depends on the number of *A. culicifacies* individuals emerging from the breeding area and coming to rest in human habitations. Adjustments must be made of density estimates based on animal-trap captures before such a figure can be obtained.

**Tobacco extract for control of arsenic-resistant blue tick and cattle lice**, P. M. BEKKER (*Farming in So. Africa*, 19 (1944), No. 225, pp. 775-780, illus. 2).—Extensive experiments are reported to have shown that *Boophilus decoloratus* can be controlled effectively provided at least 0.04 percent nicotine is added to the ordinary 7-day arsenical dip; detailed procedures are given. The results of unpublished experiments showed that over a period of 3 yr. there was no noticeable difference between animals regularly dipped in the arsenical and those treated with the added nicotine; if the ordinary precautions are taken the modified dip is no more detrimental nor has it any worse effect on the animals than the ordinary arsenic dip.

**Effect of weather on *Cochliomyia americana* and a review of methods and economic applications of the study**, D. C. PARTRIDGE. (*U. S. D. A.*). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 66-76).—Normal overwintering of the screwworm is confined by climate to the extreme southern parts of the United States. The adult fly has no well-defined resting stage, but development and activity are retarded during the cooler months. Tests in Florida, Georgia, Texas, and Arizona indicated that the average daily mean temperature for 3- and 5-mo. periods determines whether the fly overwinters in these areas; the minimum limit for the 3-mo. period was near 49° F. and for the 5-mo. period nearly 53°. Most adults were killed when the minimum temperatures fell below 20°, and practically all pupae were destroyed with minimums below 15°. Pupae withstood cold better in dry than in moist or wet media; the longest pupal period was 78 days. The lowest average daily mean temperature at which pupae survived was 47.6°; in this case the period covered was 58 days and emergence continued for 77 days; the total emergence from this series in dry range soil was 19 percent. Other influences limiting the degree of overwintering were rainfall, hosts, population of the fly at the beginning of winter, and many lesser factors. Adults lived longest during cool moist periods. Ordinarily the egg and larval stages were not materially affected by weather. The

actual maximum period of carry-over of one generation was 121 days, and the possible carry-over of combined maximum periods of all stages was 164 days. Caves, animal burrows, or manure accumulations were not indicated as increasing the area of overwintering. The study indicates that shearing at an earlier and less extended period in the fall would greatly reduce screw worm cases among sheep.

**Overwintering of Cochliomyia americana at Uvalde, Texas,** A. W. LINDQUIST and W. L. BARRETT, JR. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 77-83).—The screwworm survived the winter of 1935-36 at Uvalde in small numbers at a mean temperature of 52.5° F. mainly because of a warm midwinter period and thousands of wounded hosts, which permitted egg development and oviposition. In the winter of 1936-37 the mean temperature was 54.3°, and again the insect survived, apparently because of a midwinter period of activity. Survival of the species also occurred during the winter of 1937-38 under a mean temperature of 55.5°. A rather meager survival occurred during the winter of 1938-39 at a mean temperature of 54°. The screw worm has not exhibited hibernation tendencies, and progressively declining temperatures from a mean of about 55° lengthened the developmental period and increased the mortality of the immature stages. A mean average daily air temperature of about 51° was apparently fatal to most of the immature stages in the soil. All adults were killed in cages at a minimum of 19°, and at a minimum of 22° the flies fell to the ground, though reviving with a rapidly rising temperature and later ovipositing. Oviposition has occurred in the field at 61°, but only after several days of much higher temperatures.

**Overwintering of Cochliomyia americana and C. macellaris at Menard, Texas,** H. E. PARISH. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 83-84).—Records made during the winters of 1935-36 to 1938-39 on about 62,000 exposed screwworm larvae and pupae indicated that the temperature around Menard will not permit survival throughout the winter. No adults emerged from 12,391 secondary screwworm larvae and pupae exposed during the winter of 1936-37.

**Winter activity of Cochliomyia americana in the Southeastern States,** A. L. BRODY and E. E. ROGERS. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 85-89, illus. 4).—Studies of the nature and extent of winter activity of the screwworm at Valdosta, Ga., and Gainesville, Fla.—carried on during the winters of 1935-36 to 1938-39—indicated that in the latter area the insect could breed throughout the winter, whereas the Valdosta section proved to be nearer the northern limit of overwintering—survival in outdoor cages occurring only through the winters of 1936-37 and 1938-39, though a few natural cases of infestation were observed during a warm period in January 1936. Soil environments are somewhat significant in relation to survival of the immature stages during cold weather. Well-rotted manure appeared to provide some protection, since during cold periods a higher proportion of emergence was usually obtained from larvae planted in manure; the development was also faster than in other types of soil. The screwworm has no true hibernation period. Development of the immature stages in the soil under normal conditions takes 7-9 days, but in winter at Valdosta it was prolonged in one case to 78 days; even at Gainesville this period may attain 63 days. Adults have been kept alive for 64 days.

**Overwintering and dispersion of Cochliomyia americana in Arizona,** C. C. DEONIER. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 1, pp. 90-95).—The screwworm failed to survive the abnormally cold winter of 1936-37 in Arizona; a monthly mean of 41.6° F. was fatal to all stages during January at Tempe. Reinfestations of the ranges were apparently caused by adults migrating from Mexico; such reinfestations depend on favorable weather conditions in Arizona. The lateness of the reinfestations and drought conditions during this season prevented wide distribution or the building up of an appreciable fly population prior to the summer.

rainy season. Survival took place during the winter of 1937-38 in warm valleys of the southern part of the State, breeding continuing throughout the major part of that winter. In grass sod at Tempe a mean soil temperature of 51.3° prevented development of immature stages in the soil; in leafmold the pupae developed at a mean temperature of 52.1°. The maximum period for development of immature stages in the soil was 70 days.

The loci of olfactory end-organs in the honey-bee (*Apis mellifera* Linn.), H. FRINGS (*Jour. Expt. Zool.*, 97 (1944), No. 2, pp. 123-134, illus. 1).—An association was established between the odor of coumarin and extension of the proboscis in the honeybee by stimulating the bees with this odor while the tarsi and antennae contacted a sugar solution and they were allowed to feed. Untrained normal bees gave no response to the odor of coumarin under these test conditions. Normal bees reached a level of 97 percent positive response to the odor in 2-15 training exposures, the mean for learning being trial No. 7. All bees appeared capable of learning to associate the odor with the proboscis response, though there were individual differences in the rate of learning. This ability in untrained bees was not destroyed by removal of one antenna to the scape, or removal of one antenna to the scape with concomitant removal of the seven terminal segments of the flagellum of the other antenna; furthermore, the degree of positive response in associating the odor of coumarin with food in trained bees was not affected by removal of one antenna to the scape, or by removing it completely or to the scape with concomitant removal of the seven terminal segments of the flagellum of the other antenna. Removal of both antennae completely or to the scapes caused a loss of the conditioned response to the odor of coumarin. Removal of one antennae with accompanying removal of the eight terminal segments of the other antenna abolished the response to the odor in trained bees and caused an inability to become conditioned in the untrained individuals. The eight terminal segments of each antenna are thus the sole bearers of olfactory end organs for coumarin in the honeybee. It is suggested that there is need for much more fact gathering concerning the loci of olfactory receptors in insects before valid generalizations can be made.

Regulated temperature and humidity of packed hives aids bees in winter, E. J. ANDERSON (*Pennsylvania Sta. Bul.* 464 (1944), Sup. 1, pp. 3, 9, illus. 3).—A practical account.

## ANIMAL PRODUCTION

A comparison of sampling procedures in making pasture yield determinations, W. B. NEVENS. (*Ill. Expt. Sta.*). (*Jour. Dairy Sci.*, 28 (1945), No. 3, pp. 171-185).—Sampling procedures for the determination of pasture yields by methods previously described by Aamodt et al. (E. S. R., 89, p. 347) were compared. The direct harvest plan at monthly intervals was characterized by smaller standard errors and lower coefficients of variability than the difference plans. Tests of variance of the data obtained by four plans of sampling show significant F values for the direct harvest plan in a number of instances where such a finding would be expected, but no such values were found for the other plans. The direct harvest plan is advantageous for computing period yields and yields where grazing was delayed by rotation, and these advantages and its simplicity make it highly suitable where only yield determinations of the pastures are desired. Valuable checks on the direct harvest plan are provided by the three difference plans. In one plan a sample is taken just before the cattle are turned on the pasture, and a wire cage is placed over a representative area. At monthly intervals thereafter, representative samples were taken under and outside the cages for getting at the

differences, except for such crops as soybeans and sweetclover, which were killed or greatly retarded in growth. In other difference methods, monthly yield was compared with the growth made in previous months. Yearling dairy heifers also furnished data on the maintenance of live weight per acre. The total digestible nutrient values were more closely related to the yield of dry matter followed by the direct harvest plan than its yields as determined by the different plans. The direct harvest plan, therefore, appears to be the most satisfactory of the four plans of sampling for determining the yields of bluegrass pasture. A bibliography of 23 references is included.

**Renovation increased protein in pasturage,** D. M. SEATH and L. L. RUSOFF (*Dairy Res. Digest [Louisiana Sta.], 3 (1945), No. 1, p. 2*).—Herbage harvested in 1944 after renovating and reseeding pastures in the fall of 1943 from a farm at Mount Hermon showed 23.9 percent more protein than was produced by similar pastures not renovated or reseeded. On June 30, pasture samples from several renovated areas averaged 14.61 percent protein as contrasted with 8.25 percent protein from unrenovated pastures.

Each acre of improved pasture produced 4 tons of air-dried hay, which contained an average of 13.2 percent protein.

**Ensilage investigations with tropical forages,** D. D. PATERSON (*Trop. Agr., [Trinidad], 22 (1945), No. 3, pp. 43-48, illus. 3*).—Preliminary investigations were conducted on ensilage of tropical grasses and legumes. Six experimental silos 6 ft. high and with 3 ft. internal diameter, which held about  $\frac{1}{2}$  ton of silage, were constructed of cement. About 20 forages and mixtures with legumes were tested, with a period of not less than 4 weeks for ensiling. Chaffing insures good mixing and compaction, thereby reducing surface waste. The addition of 2 gal. of molasses per ton of green herbage tended to improve the quality of the silage and reduced waste. Where mixtures with legumes were included, up to 4 gal. of molasses were recommended, and with legume silage, 6 gal. of molasses per ton. Green herbage with less than 20 percent dry matter was inadvisable for ensiling. Losses through fermentation and surface wastage did not exceed 10-15 percent. The loss in fermentation and surface wastage was tested in two bulk lots of silage of Guatemala grass, one in a pit and one in a bamboo clamp. The 33 percent loss through fermentation, drainage, and surface wastage from pit silos could have been reduced. In three pit silos losses from 23.57 to 38.8 percent occurred from fermentation and surface spoilage in silage from Para grass, woolly pyrol, and sugarcane. The cattle, ranging from purebred Zebu heifers to  $\frac{3}{4}$ -bred Holstein and Zebu stud bulls, took to the silage readily and more than maintained their weight in a 15-day period. An average of 70 lb. of silage was consumed per day by a 700-800-lb. animal. Need for providing drains from silos is debatable, but too free drainage may promote mineral deficiencies.

**Report on inspection of commercial feeding stuffs for 1944,** L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 521 (1945), pp. 24*).—The guaranteed and found analyses of 832 samples of feeds collected during the year 1944 are presented in accord with the methods previously used (E. S. R., 91, p. 578).

**Das Reichstierzuchtgesetz und seine Durchführung im Kriege [German animal breeding and its pursuit in the war],** edited by F. PFENNINGSTORFF (Berlin: Editor, 1943, pp. 296, illus. about 650).—Descriptions of livestock breeding in different areas of Germany, with many excellent illustrations of horses, cattle, sheep, goats, and swine.

**The livestock of China,** R. W. PHILLIPS, R. G. JOHNSON, and R. T. MOYER (*U. S. Dept. State Pub. 2249, Far East. Ser. 9 (1945), pp. 174+, illus. 77*).—Descriptions and illustrations of the types, management, and breeding of various animals and poultry found in different parts of China for which improvement was

described (E. S. R., 92, p. 548) are presented. An extensive bibliography is included.

**Absorption of volatile acids from the alimentary tract of the sheep and other animals**, J. BARCROFT, R. A. McANALLY, and A. T. PHILLIPSON (*Jour. Expt. Biol.*, 20 (1944), No. 2, pp. 120-129, illus. 3).—The volatile acid content of the blood draining from various digestive organs was shown in sheep to be high in blood from the rumen and nearly as high in blood from the reticulum. Volatile acid in blood from the omasum, though much less, was significantly greater than that in the peripheral blood. It was also significantly increased in blood draining from the caecum or colon of the horse, pig, and rabbit. Evidently acetic acid is the predominant acid present in both the rumen contents and in blood draining from the rumen. Acetate is rapidly absorbed, propionate less so, while butyrate is slowly absorbed. "The quantity of volatile acid calculated as acetic acid absorbed in an hour from the reticulum and rumen together is estimated to vary from 1 to 5 gm., but this value must be regarded as minimal."

**Vitamine und Vitaminnangelkrankheiten bei Haustieren, für Tierärzte, Ärzte, und Forschungsinstitute [Vitamins and vitamin deficiency diseases of domestic animals, for veterinarians, physicians, and research institutions]**, O. SELFRID (Stuttgart: Ferdinand Enke, 1943, pp. 270+, illus. 86).—The symptoms of deficiencies of vitamins A, B<sub>1</sub>, B<sub>2</sub>, B<sub>4</sub>, B<sub>6</sub>, B<sub>c</sub>, C, D, E, H, K, and M, and nicotinic acid and pantothenic acid in the various classes of animals and poultry are reviewed. A multiplicity of citations is given on the influences of deficiencies and excesses of each of the vitamins and the relationships of one vitamin to another.

**Grazing management practices and their relationship to the behaviour and grazing habits of cattle**, D. B. JOHNSTONE-WALLACE and K. KENNEDY. (Cornell Univ.). (*Jour. Agr. Sci. [England]*, 34 (1944), No. 4, pp. 190-197).—The grazing habits of Aberdeen Angus and Hereford cows on 3-7-acre pastures of Kentucky bluegrass were observed in 24-hr. periods in July, August, and September. Only 7-8 hr. in 24 were spent in grazing, even though the height of the herbage varied. Of this time only about 5 hr. were spent in actually feeding on the plants, the rest of the time being utilized in locating the areas to be grazed later. On an average 60 percent of the grazing was done by day when the average distance traveled was 2 miles, leaving 40 percent of the grazing by night when the average distance traveled was only  $\frac{1}{2}$  mile. Each cow consumed about 150 lb. per day of green herbage from a dense sward 4-5 in. in height, but the amount was reduced to 45 lb. with less forage. Data are recorded as to the time spent by the cattle in micturition, defecation, drinking, and suckling their calves.

**Wintering beef cows in the rice area**, M. G. SNELL, C. I. BRAY, F. L. MORRISON, M. JACKSON, and A. S. GATES (*Louisiana Sta. Bul.* 387 (1944), pp. 31, illus. 10).—Supplementing rice straw and pasture with 3 lb. of a mixture of rice products (rice bran and rice polish) and cottonseed meal for 90-112 days reduced death losses from 5.7 to 1.04 percent, increased the calf crop 6.3 percent, and produced calves earlier in the spring. The feeding of the concentrates to the cows in the winter increased the birth weight of the calves about 5 lb. per calf and produced calves about 18 lb. heavier at weaning. With rice straw alone and pasture the cows averaged 66.6 percent of the birth weights of the calves produced by cows receiving the concentrates during winter feeding, when the calf crop was increased to 72.9 percent. Good calves may be raised by strong cows wintered on rice straw without extra feeding. Additional care should be provided the weaker cows or young heifers with calf during feed shortages and cold weather. Earlier breeding, larger calf crops, and reduced death losses may result from increased care and feeding of stronger cows as well. There was no greater benefit from feeding oystersHELLS, disodium phosphate, or bone meal as a supplement with salt than the results obtained with salt alone. For the study 96 cows were divided into 8 lots

of 12 each, wintered on rice straw and pasture with mineral supplements of salt, disodium phosphate, ground oystersHELLS, or with a mixture of these minerals with bone meal alone.

Fattening steers on corn, rice products, and rice straw, M. G. SNELL, C. I. BRAY, F. L. MORRISON, and M. E. JACKSON (*Louisiana Sta. Bul.* 389 (1945), pp. 25).—Carrying forward studies of rice byproducts for feeding beef cattle, experiments on the comparative feeding value of rice bran, rice polish, ground rough rice, and chicken-feed rice, were compared in tests lasting about 112 days with groups of 10 steers each, with cottonseed meal and alfalfa hay or rice straw in four experiments. The rice straw supplemented with a small amount of good alfalfa hay was more economical than legume hay alone. Good gains were produced by feeding steers on rations consisting principally of rice byproducts. At current prices, corn was more profitably fed without rice byproducts. The second highest profits were made with a ration consisting of corn, cottonseed meal, rice bran, molasses, and rice straw, but rice bran produced only fair profits when fed as the only carbonaceous concentrate. Without molasses, rice polish ranked second to corn. Rice polish at \$31.20 per ton and rice bran at \$22.80 were not as profitable as corn at \$36.00. Gains and finish were improved by the substitution of 33 percent molasses for an equal amount of corn. Rice straw was more profitable than hay. The feeding value of rice bran and rice polish appeared to be low compared with that shown by results obtained with swine and poultry. It appeared that rice bran and rice polish could be more profitably fed to milk cows, poultry, and hogs than to beef steers.

Beef calf production in Mississippi, R. H. MEANS, E. B. FERRIS, and S. P. CROCKETT (*Mississippi Sta. Bul.* 412, rev. (1945), pp. 34, illus. 20).—A revision of Bulletin 371 (E. S. R., 88 p. 798), with brief reference to beef calf production and pasture management at the Natchez and Holly Springs Branch Stations and the Oktibbeha-Winston Land Use Experimental Area and the central station.

The food value of beef from steers and heifers, and its relation to dressing-out percentage, E. H. CALLOW (*Jour. Agr. Sci. [England]*, 34 (1944), No. 4, pp. 177-189, illus. 3).—Beef from a varied group totaling 14 steers and heifers of 5 breeds ranging from 1 to 4 yr. in age and from about 650 to 1,400 lb. in weight, with dressing percentages from 50 to 62 percent, was studied as to nutritive value. The chemical composition of the beef varied widely, as well as relationships between the fat, water, and protein. The data were also expressed on a live-weight basis. About one-third of the live weight was due to muscular tissue, 6.8 percent to protein, and 25.5 percent of the edible meat to water. A slightly higher percentage of muscular tissue, and hence protein and water, is found in young light-weight cattle than in old heavy-weight animals. The dressing percentage depends almost entirely on the stage of fatness of the animal. For every increase of 1 percent in the dressing percentage the fat tissues of the carcass increased 1.43 percent. Equations are presented for calculating the food value of steer and heifer beef. Palatability was shown to be related to fatness and improved until the cut was not more than one-third fat. The price of the beef depends on its fat content. Formulas for calculating prices from a knowledge of these conditions are presented.

Studies on deglutition in sheep.—I, Observations on the course taken by liquids through the stomach of the sheep at various ages from birth to maturity, R. H. WATSON. II, Observations on the influence of copper salts on the course taken by liquids into the stomach of the sheep, R. H. WATSON and I. G. JARRETT (*Austral. Council Sci. and Indus. Res. Bul.* 180 (1944), pp. 126, illus. 12).

Grade Southdown sires for sucker-lamb production, J. S. STARKE (*Farming in So. Africa*, 19 (1944), No. 222, pp. 553-564, illus. 4).—Among the lambs produced by 287 crossbred Persian Merino ewes sired by one-half-, three-fourths-, seven-

eighths-, and full-blood Southdowns, there was no marked difference in the fertility. The purebred Southdown rams sired lambs heavier at birth than the one-half- and three-fourths-blood Southdown rams, but there was no significant difference in the rate of growth of lambs sired by the rams of different grades of Southdown breeding. The Persian crossbred ewes showed superiority over Merino crossbreds as mother ewes for the production of lambs. Carcasses from half-bred Southdown sires were of lower grade than those from the other sires, due to a poorer conformation and distribution of fat. It appeared that a certain amount of Blackhead Persian blood is desirable for lamb production. A high-grade Southdown Persian ram is preferred to a purebred Southdown ram if the ewe is a Merino cross. A purebred Southdown ram is more likely to give better results where the ewe is a Persian crossbred.

**Growing and fattening hogs in Alabama**, W. E. SEWELL (*Alabama Sta. Leaflet 21 (1945)*, pp. [4]).—General directions for feeding, management, and treatment of diseases and parasites of hogs.

**The digestibility of typical eastern Canadian feeds by market bacon hogs, III**, E. W. CRAMPTON and J. M. BELL (*Sci. Agr.*, 25 (1944), No. 1, pp. 43-50, illus. 1).—Continuing this series (E. S. R., 90, p. 513), the digestibilities of protein, ether extract, and soluble carbohydrates of wheat and corn were remarkably similar. The content and digestibility coefficients of the organic fractions of standard and degenerated shorts were quite similar, but the growth rates of the animals while on test showed the superiority of the standard shorts. The digestibility coefficients were sufficiently different from those with ruminants to warrant separate trials with swine. The digestibility trials were conducted with mixed rations in 10-day periods following a 5-day preliminary period with urine and feces collected at regular intervals. The four swine used in the trials weighed 50, 100, 150, and 200 lb., respectively, at the start.

**Significance of the B-vitamins in swine nutrition**, B. W. FAIRBANKS and J. L. KRIDER. (*Univ. Ill. Vet.*, 26 (1945), No. 1, pp. 18-23).—A general review of the needs of swine for the B vitamins indicates that the pig requires thiamine, riboflavin, niacin, pantothenic acid, pyrodoxin, and choline for normal growth and well-being. *p*-Aminobenzoic acid may be needed for lactation. The need for inositol, folic acid, and other less-known B factors is not understood.

**Judging saddle horses and roadsters**, J. A. BARLY (*Milwaukee, Wis.: Author, 1945*, pp. 358+, illus. 22).—The principles and directions for judging saddle horses and roadsters, with special descriptions and comments on outstanding individuals.

**The value of prunes as a constituent of dog food**, A. F. MORGAN and M. GROODY. (*Univ. Calif. Jour. Amer. Vet. Med. Assoc.*, 105 (1944), No. 312, pp. 282-286, illus. 4).—Male and female dogs fed 40 gm. of a mixture of five dry feeds with 10 gm. of prunes per kilogram of live weight per day for up to 11 mo. grew more rapidly and to better final weights in 11-13 mo. than controls given the same rations without prunes. The serum vitamin A of the prune-fed dogs was slightly the higher and the liver vitamin A reserves were generally greater than those which received no prunes. The dogs in the second generation fed canned foods with or without prunes had from 10 to 20 times as much liver vitamin A as those fed the dry ration. Whole prunes, including pits, ground to a paste were found to be as satisfactory as prune flesh alone. There were included in this study four chows and five Fox Terriers fed to 11-13 mo. of age. Of six pups produced in the second-generation group, those that were fed prunes were superior in rate of growth to those receiving the dry rations only. Prune paste is regarded as an economical and physiologically advantageous ingredient of dog foods.

**The effect of heat, insulation, and artificial light on egg production and feed consumption of pullets**, H. S. GUTTERIDGE, S. BIRD, H. I. MACGREGOR, and J. M.

PRATT (*Sci. Agr.*, 25 (1944), No. 1, pp. 31-42).—Experiments covering 4 yr. consistently showed as high egg production during the winter months under unheated conditions as with heat or insulation when temperatures ranged from 37.8° to 59.9° F. There was a maximum saving of 4.7 lb. of feed per bird per year and an average of 2.85 lb. in the heated houses. There was no detrimental effect from closing all the ventilators of the poultry houses with a resulting temperature of 45.6° and very high humidity. Reduction of window areas to increase insulation but shut out sunlight resulted in little change in temperature because the two factors worked in opposite directions.

Digestibility of feeds and human foods by chickens, G. S. FRAPS (*Texas Sta. Bul.* 663 (1944), pp. 22).—A summary is presented of 718 digestion experiments with chickens. The feeds tested included chicken feeds, some human foods, and some nutrients contained in feeds, such as albumin and casein to represent protein, starch to represent carbohydrates, and cottonseed oil to represent fats. The variability of the coefficients of digestibility is indicated by the standard deviations when four or more experiments were available for the same feed. The digestibility of the nutrients of an entire ration was less variable than the digestibility of the nutrients of corn meal fed as 50 percent of the ration. Higher variability was indicated for the digestibility of nutrients present in low percentages. It is assumed that the higher variability is due to work rather than differences in digestibility of the individual nutrients. Low standard deviations were found for many of the feeds, especially for nutrients present in high percentages. Fat was digested to a smaller extent from rations high in protein than from those low in protein. It was shown that small variations in the digestibility of rations may appear as much larger variations in the digestibility of individual feeds in the ration. Methods for determining uric acid were also studied.

Wheat fermentation by-products in poultry rations, F. E. MUSSEHL, R. M. SANDSTEDT, and W. HAM (*Nebraska Sta. Bul.* 371 (1945), pp. 6, illus. 2).—Wheat fermentation byproducts were fed for a 273-day production period at 4.3 and 13.5 percent levels to 2 of 3 lots of 250 Leghorn hens each. One lot receiving a ration of 26.1 percent protein with meat scrap, fish meal, and soybean meal added to other components of the ration produced an average of 137 eggs, whereas other groups with 4.3 and 13.5 percent wheat fermentation byproducts in place of fish meal protein produced averages of 132.2 and 133.1 eggs per bird. The hatchability of nearly 6,000 eggs laid by each of these groups was 75 and 76 percent with the two rations. The size of eggs was also similar for the 3 groups.

The riboflavin requirement of the White Wyandotte chick, W. BOLTON (*Jour. Agr. Sci. [England]*, 34 (1944), No. 4, pp. 198-206, illus. 2).—For optimum growth and feed efficiency to 6 weeks of age, White Wyandotte chicks required 3 µg. of riboflavin per gram of feed. For the prevention of curled-toe paralysis there were required 3.6 µg. per gram of feed. The curve relating the riboflavin content of the ration to the riboflavin content of the liver has a sigmoid form and generally tends to lie asymptotically to values of about 26 µg. of riboflavin per gram of fresh liver when the intake is grossly deficient, and 39 µg. of riboflavin per gram of fresh liver when the intake is fully adequate. In view of these findings it is suggested that the riboflavin content of the liver may be a more satisfactory measure of the minimum riboflavin requirement for full well-being than the amounts necessary to promote optimum growth and prevent curled-toe paralysis. These findings were arrived at in a series of four experiments in which groups of about 20 chicks were depleted of riboflavin in 10 days to 2 weeks and continued for 4 more weeks on basal rations with supplements of different amounts of dried skim milk, dried liver meal, and dried lung meal supplying riboflavin. The livers of the experimental birds were assayed for riboflavin in each case.

The results when vitamin D and calcium fail the layers, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bim. Bul.* 232 (1945), pp. 9-15).—Results are presented of the ill effects upon layers caused by deficiencies of calcium and vitamin D. The two deficiencies may occur independently as well as together. For the test of 46 weeks' duration, 4 lots of 50 Rhode Island Red pullet layers were fed so that one group received oystershells and vitamin D feeding oil. Others were fed without oystershells but with vitamin D feeding oil, with oystershells but without vitamin D feeding oil, and with oystershells without vitamin D feeding oil until after February 16. The percentages of egg production in these groups were, respectively, 47, 25, 35, and 31. The percentage of weak or thin-shelled eggs indicated by the shock test (E. S. R., 92, p. 554) ranged from 64 to 76 percent in different parts of the year with vitamin D feeding oil but without oystershells. However, the percentage of weak or thin-shelled eggs with oystershells but without vitamin D feeding oil ranged from 8 to 71 percent. The other lots also indicated the equal or greater importance of oystershells than vitamin D in maintaining shell strength.

Mortality studies in Rhode Island Reds, F. A. HAYS (*Massachusetts Sta. Bul.* 420 (1944), pp. 20, illus. 4).—Mortality records were secured over an 8-yr. period on 22,175 chicks up to 8 weeks of age, 5,067 males and 9,526 females from 8 weeks to 6 mo., and 1,132 males and 5,803 females from 6 to 18 mo. of age for Rhode Island Reds and a few crosses between Rhode Island Reds and Barred Plymouth Rocks or Buff Orpingtons. The results indicated that selective breeding was not effective in reducing the mortality rate between hatching and 8 weeks of age. The low mortality line indicated no decline during the same period, nor was there any increase in mortality. Mortality from all causes in males and females between the ages of 6 and 18 mo. was not decidedly reduced by selective breeding, and changes in high and low mortality lines were insignificant. The avian leucosis complex showed a cyclic behavior in the 8-yr. period as demonstrated by necropsy records. It was likely to be accompanied by other diseases and disorders. Digestive disorders were noted in the birds examined after death. Miscellaneous diseases and disorders were not prominent. Cannibalism was variable and generally more destructive in males than in females.

Improving turkey production, R. S. DEARSTYNE, C. H. BOSTIAN, and W. B. NESBIT (*North Carolina Sta. Bul.* 350 (1945), pp. 26, illus. 9).—A comprehensive statement is given of the principles of improved methods of breeding, feeding, hatching, and fattening turkeys. Data obtained in station research are tabulated and shown graphically.

Source of vitamin D determines amount of supplement required in turkey feed, R. V. BOUCHER (*Pennsylvania Sta. Bul.* 464, Sup. 1 (1944), pp. 2, 8, illus. 1).—In two experiments, four sources of vitamin D—U. S. P. Reference Cod Liver Oil No. 2, irradiated animal sterol, irradiated 7-dehydrocholesterol, and sardine oil fortified with fish-liver oils—were fed at different levels to groups of 19 and 20 poult's, respectively, supplementing a rickets-producing ration during the first 4 weeks of life. Differences in the bone ash of the birds receiving different amounts of the supplements suggested that the poult's exhibited a higher degree of species specificity than chicks. Vitamin D of the irradiated animal sterols was about twice as efficacious, on the chick unit basis, as cod-liver oil. Sardine oil was more efficacious than cod-liver oil, yet its response curve was more like cod-liver oil than irradiated sterols. The kind of vitamin D employed must be taken into account in calculating requirements. If cod-liver oil or sardine oil is used, the minimum requirement appears to be near 900 A. O. A. C. chick units per pound of ration, while 360-450 units from irradiated animal sterols were equally effective. Theoretically, turkeys may be used to differentiate vitamin D of the sterol types.

**Preservation of eggs by the flash-heat treatment.** A. L. ROMANOFF. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 2, pp. 2-3, illus. 1).—Dipping shell eggs in boiling water for 5 sec. slowed the rate of deterioration over a 12-mo. storage period and was an effective method of preservation. A thin film of albumen formed in the egg, but the whipping quality was not interfered with and fertile eggs even remained viable.

## DAIRY FARMING—DAIRYING

**Experiments on the use of home-grown foods for milk production, III, IV** (*Jour. Agr. Sci. [England]*, 34 (1944), No. 4, pp. 213-222).—In further studies (E. S. R., 91, p. 458), two papers are presented.

**III. The effect of over- and under-feeding during mid-lactation.** K. L. Blaxter (pp. 213-216).—During mid-lactation 12 cows were divided into 3 groups of 4 each. A control ration was fed to all groups during a preliminary period. Thereafter, in addition to the control ration, groups were fed as follows: (1) Supplement of 4 lb. of hay and 16 lb. of mangels, (2) 4 lb. of concentrate of equal feeding value, and (3) reduction in the ration by 4 lb. of hay and 16 lb. of mangels. The rations were changed at weekly intervals. The results show that changes in milk yield due to changes in the level of feeding were relatively small. When short-term feed shortages occur in well-fed herds, economy should take place in the rations of cows in mid-lactation rather than in the rations of cows soon to calve.

**IV. Methods of feeding bulky foods,** K. L. Blaxter and T. H. French (pp. 217-222).—No differential effect on milk yield or milk composition of feeding cows rations in which the same feeds were supplied in different ways could be detected. There was no advantage from increasing the number of meals into which a ration was divided or spreading the ration over a longer period. There was much more difference between the consumption of individual cows fed an overhead ration than between cows fed by individual methods.

**The digestibility and feeding value of undusted and sulphur-dusted peanut-vine hay,** A. D. PRATT and J. F. EHEART (*Virginia Sta. Bul.* 366 (1945), pp. 14, illus. 7).—Feeding and digestion trials were conducted with sulfur-dusted and undusted peanut-vine and alfalfa hays. Each hay was fed to groups of two cows each for 21-day periods by the reversal method, each group being fed one type of hay during the first period, another hay in the second period, and a third kind during the third period. The peanut-vine hay contained slightly over 14 percent protein, which was nearly as high as alfalfa hay. Practically the same digestibility of the dusted and undusted peanut-vine hay was obtained. The peanut hay resulted in at least as high milk production as high-grade alfalfa, and evidently alfalfa hay may be satisfactorily replaced by sulfur-dusted or undusted peanut-vine hay if the protein content of the grain mixture is adequate. The milk production and feed consumption of each of the six cows in the three 21-day periods on each type of hay were presented.

**Mammary development in the thyropriived bovine by stilbestrol and thyroprotein administration,** W. E. PETERSEN, C. B. KNODT, T. M. LUNDWICK, and B. S. POMEROY. (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 3, pp. 332-334).—Diethylstilbestrol was administered alone and later together with thyroid replacement therapy to two thyropriived cows with marked clinical myxedema, but no mammary development occurred in five experiments over several months. Substantial mammary development and lactation resulted from diethylstilbestrol administration following recovery from myxedematous symptoms resulting from thyroprotein therapy. Failure of mammary development in the myxedematous animals was due to some phase of the myxedema, and the response obtained following thyroid therapy was not due to a synergistic action of thyroxine and diethylstilbestrol.

**Latex in the preparation of corrossions of mammary glands,** H. E. BECHTEL and W. M. MCLEOD. [Kans. State Col.]. (*Amer. Jour. Vet. Res.*, 6 (1945), No. 18, pp. 17-20, illus. 4).—A procedure is described for injecting mammary glands with neoprene latex after freshly excised glands have been irrigated with a weak acid solution. Anatomical arrangements of the milk-containing structures have been revealed by the molds.

**Factors affecting the production of dairy cows,** F. B. HEADLEY. (Coop. U. S. D. A.). (*Nevada Sta. Bul.* 172 (1944), pp. 23, illus. 5).—Lactation records of dairy cows on all-hay and hay-and-grain rations were summarized for the first 280 days of each lactation period. The production of milk was increased 17.7 percent by the grain ration. When changes in live weight were taken into account an actual consumption of nutrients closely approximated theoretical requirements. The all-hay group involving 26 lactations consumed 0.5 lb. more of the total digestible nutrients and the hay-grain groups with 27 lactations consumed 0.8 lb. more of total digestible nutrients than theoretical requirements. A greater efficiency was exhibited by high-producing then by low-producing cows in the utilization of feed as expressed by quantity of milk produced per unit of digestible nutrients consumed. Common fat standards may be inaccurate as a guide for calculating daily rations for individual cows. Nutrient consumption was maintained at its highest level between 8 and 16 weeks of lactation, when cows were allowed to eat all the roughage they would consume with or without supplementary grain. The data presented in U. S. D. A. Technical Bulletin 815 (E. S. R., 88, p. 116) were summarized, and a method for predicting the fat-corrected milk at different levels of feeding was devised. A nomograph chart was devised to estimate differences in production with accompanying changes in feeding levels.

**Some studies of lactation records,** T. E. WOODWARD. (U. S. D. A.) (*Jour. Dairy Sci.*, 28 (1945), No. 3, pp. 209-218, illus. 3).—Study of 15,442 lactation records of cows in Dairy Herd Improvement Associations herds showed the milk records of cows calving in different months of the year to range from 8,886 lb. for cows calving in July to 9,108 lb. for cows calving in November. The average lactation curves of these cows grouped according to high, low, and medium producers showed that the range in ratio of 1 day's milk yield to total production was most reliable at 7 mo. after calving. Thus this was the time at which the annual production could be estimated for the cows of the three production levels. From 360 records of California cows, the percentage of butterfat was lowest in the third month of lactation, after which there was a steady increase in percentage to the end of lactation. As in the larger group from all States, milk production was highest in the second month of lactation, with a decline to the end of the lactation period.

**The occurrence in winter of milk with a low content of solids-not-fat,** S. J. ROWLAND (*Jour. Diary Res. [London]*, 13 (1944), No. 3, pp. 261-266, illus. 1).—The solids-not-fat content of milk samples produced in a certain area in the early months of 1942 and 1943 was unusually low. A high proportion of the individual herds yielded milk containing less than the presumptive standards of 8.5 percent solids-not-fat. The freezing point depression of this milk was normal. The solids-not-fat content showed standard improvement in May. The low level was thought due to a low plane of nutrition of the cows.

**The vitamin A content of Louisiana milk and butter as related to nature of pasture,** E. A. FIEGER and H. LEWIS (*Louisiana Sta. Bul.* 388 (1944), pp. 22, illus. 1).—Milk of 25 dairy herds analyzed monthly from October to April for carotene and vitamin A varied from 1,280 International Units per quart in January to 2,805 I. U. in April. Per quart, the winter milk furnished about one-fourth of the daily need for an adult, while fall and spring milk furnished two-fifths to three-

fifths of the human daily requirement. The average values for six creamery samples were slightly lower than those for the herd samples, varying from 993 I. U. to 2,507 I. U. per quart during April. About one-fifth of an adult's daily requirement was supplied by winter milk, and about one-fourth by October milk, while spring milk was of excellent quality and supplied two-fifths to one-half of an adult's daily need. Per pound of Louisiana-produced butter, 7,918-23,157 I. U. were produced. The vitamin A quality of the milk was raised from fair to excellent as a result of fall-planted oats for use in pasture during the winter and early spring. December milk had 780 I. U. per quart increase as a result of this treatment, but during the rest of the months a practically consistent average increase of 440 I. U. was produced. The milk yield and health of the herd were also improved as a result of the fall-planted oat pasture. Clover pastures were also recommended for increasing the vitamin A potency of the milk.

**Resazurin triple reading test for grading the quality of raw milk.** M. C. NIXON and A. B. LAMB (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 1, pp. 18-23).—The triple resazurin test as outlined by Johns and Howson (E. S. R., 83, p. 537) on 190 raw milk samples received from six different localities and 160 individual quarter samples was shown to be reliable when compared to leucocyte count, standard plate count, and direct microscopic smear. The resazurin test was quite accurate when dealing with mastitis cows, but gave some positive cases where some other tests failed to show any abnormality.

**A study of methods for the microscopic examination of raw milk, with suggested improvements.** W. L. MALLMANN, C. S. BRYAN, and W. D. BATEN. (Mich. Expt. Sta.). (*Jour. Milk Technol.*, 7 (1944), No. 6, pp. 315-321, illus. 1).—The Bryan loop technic for the microscopic determination of the bacterial content of milk (E. S. R., 80, p. 536) was equally as accurate as the pipette technic. A sharper contrast was obtained by the use of a Wratten M filter or its equivalent between the light source and the object. The Bryan loop technic may be adopted as an alternate to the pipette technic for the examination of milk. About 10 fields should be counted when the microscopic fields average at least one bacterial cell per field, but when no organisms were found in 10 fields at least 50 fields should be counted. These methods are recommended for raw but not for pasteurized milk.

**The effect of various homogenization pressures on the leucocyte count of milk.** I. I. PETERS and G. M. TROUT. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 3, pp. 251-256, illus. 3).—Milk was pasteurized at 142°-144° F. for 30 min. and homogenized at various pressures, ranging from 2,000 to 2,500 lb. per square inch. In all but 4 of 30 trials, the number of leucocytes found in non-homogenized milk exceeded the count in homogenized milk. These exceptions were in the low-count milk to which no leucocytes had been added. The reduction in leucocytes with homogenization of 2,500 lb. pressure averaged 41.28 percent, and at 5,000 lb. pressure 92.4 percent. A reduction of 99.1 percent in the leucocyte count was produced by homogenization at 5,000 lb. for 10 min., but the intensity of the sediment was the same. Additions of increasing proportions of high-pressure homogenized milk to normal clarified homogenized milk resulted in an increase in intensity of the sediment in the mixture.

**Mastitis and the plate count of milk.—V, The behavior of *Streptococcus uberis* in milk held at different temperatures.** H. W. SEELEY, JR., E. O. ANDERSON, and W. N. PLASTRIDGE. ([Conn.] Storrs Expt. Sta.). (*Jour. Milk Technol.*, 7 (1944), No. 6, pp. 329-337, illus. 1).—Cooling temperatures of 40°, 50°, 60°, 70°, and 97° F. were compared as to increases in counts of milk cultures of 15 strains of *S. uberis* cultures used in previous studies of this series (E. S. R., 92, p. 556). During the 60-hr. period samples were removed at intervals and tested for pH and plated in standard agar. Individual differences in the cultures were shown in the population increases at 40°. At 50° one-third of the cultures showed a population

increase. All cultures multiplied rapidly at 60°, 70°, and 90°. The pH of the milk cultures did not change at 40° or 50° during the entire period, but perceptible changes in the pH were noted after 48 hr. at 60°, 36 hr. at 70°, and after 12 hr. at 97°. The critical temperature for multiplication was about 50°, as at lower temperature there was little growth and increasing rapid multiplication occurred as the temperature was raised. The presence of *S. uberis* mastitis in a herd may contribute materially to the total plate count if the milk is stored above 50°.

**Problems in churning diverted cream,** J. C. MARQUARDT (*Vnrl. Butter and Cheese Jour.*, 36 (1945), No. 2, pp. 22, 24).—Analysis of butter from cream diverted from ice cream, market milk, or cheese factories made it apparent that much of the butter contained more fat than was legally required, and the curd content could have been higher without interference with legal requirements. The study was on 2,500 lb. of butter made from diverted cream.

**The manufacture of Cheddar cheese from pasteurized milk,** H. L. WILSON, S. A. HALL, and L. A. ROGERS. (U. S. D. A.). (*Jour. Dairy Sci.*, 28 (1945), No. 3, pp. 187-200, illus. 3).—Pasteurization in the manufacture of Cheddar cheese was distinctly beneficial. Lots of 800 lb. of milk were divided into two portions, one of which was pasteurized by the continuous or holding method. The cheese was cured at 50° F. and graded when 1 yr. of age. Cheese made from pasteurized milk was uniformly good and that from raw milk definitely lacking in uniformity. Off-flavors were noted in three lots of raw milk cheese that scored 90 or lower. Laboratory cheeses were better from pasteurized than from raw milk in 19 out of 21 instances. All but one sample from pasteurized milk scored 92.5 to 93.5. Off-flavors were found in three lots of raw-milk cheese that scored 90 or lower. Cheese from pasteurized milk cured for 33 mo. in cans was of excellent quality and had a fine well-developed flavor. Cheese from raw milk that scored 92 or higher when 1 yr. old developed a slightly sharper but not as pleasing a flavor, and it had an acid and in some cases a bitter flavor.

In another series of experiments, four lots of cheese were made from 1,600 lb. of milk. One lot was pasteurized, one lot was not pasteurized, and two were inoculated with an active culture of either *Aerobacter aerogenes* or *Streptococcus lactis* or a mixture of the two and allowed to ripen at 73° for 3-5 hr., cooled to 40°, and held overnight. One-half of the inoculated milk was pasteurized and the other half unpasteurized. Pasteurization of milk usually but not invariably improved the quality of the cheese made from uninoculated and inoculated milk. In nearly every instance cheese made from inoculated and ripened milk was considerably superior to that of cheese from corresponding milk of inferior quality. Nearly all of the cheese from milk of inferior quality was very poor, even when the milk was pasteurized. Evidently pasteurization was only partially effective in avoiding defects in the cheese from poor quality milk. In general, cheese from inoculated and ripened milk had lower pH values at milling than cheese from normal milk.

The development of acidity from Cheddar cheese follows a rather definite pattern and usually attempts to reach a point determined by exhaustion of the milk sugar. The maximum acidity reached in normal Cheddar cheese is usually about pH 4.95 to 5.05. The rate of acid formation is important in making good cheese and is under the control of the cheese maker. The studies showed that the amount of starter should be limited to what is needed to insure a slow but gradual fermentation, so that at milling—not less than 4½ hr. after setting—the pH of the curd will not be below 5.30 and not much above 5.50. When removed from the press about 24 hr. after setting, it should still contain an appreciable amount of milk sugar for continuance of fermentation. This slow gradual fermentation with pasteurized milk of good quality will avoid acid and bitter flavors that impair a large portion of Cheddar cheese normally made. Cheese from pasteurized milk of good quality with control of the development of acid may be ripened safely at temperatures

permitting the continued acidity of essential bacteria and insuring the development of the characteristic Cheddar cheese flavor. The temperature may be as high as 50° F. and possibly even higher. A temperature as low as 34° should not be used for ripening but may be employed for storing ripened cheese and for retarding the development of undesirable flavors.

Fat degradation in Cheddar cheese made from pasteurized milk, without and with added lipase, F. J. BABEL and B. W. HAMMER (*Iowa Expt. Sta.*). (*Jour. Dairy Sci.*, 28 (1945), No. 3, pp. 201-208.)—The fat acidities of 21 lots of Cheddar cheese made from pasteurized milk without added lipase were similar at 3 days of age. Increase in the acidity occurred throughout the ripening period up to 9 mo. These increases were not uniform and could not be correlated with the pH of the cheese, acidity of the whey at milking, or moisture or fat content of the cheese. The fat acidities of 19 cheeses made with extracts and powder of rennet increased at approximately the same rates. Purified butterfat did not increase significantly in acidity at cheese ripening temperatures. There was an increase in the fat acidity of the cheese from additions of small amounts of rennet paste. Some of the cheeses showed varying degrees of rancidity early in ripening, which disappeared or nearly disappeared before the cheeses were 6 mo. old. Cheeses made with rennet paste that were not rancid were superior in flavor to control cheese. Addition of a small amount of rennet paste (13-40 gm. per 1,000 lb. of milk) tended to mask the sour, acid flavor frequently encountered in the control samples. Larger amounts of rennet paste (50-225 gm. per 1,000 lb. of milk) increased the fat acidity of the cheese. Rancidity was shown by all cheese at some time during ripening. Additions of lipase in the form of mulberry juice to pasteurized milk did not improve the flavor of the resulting cheese. The flavor of process cheese was benefited by the addition of aged cheese showing definite fat hydrolysis. Additions of rennet paste to process cheese with aged cheese improved the flavor.

The influence of "abnormal" milk upon the yield and quality of Cheddar cheese, C. K. JOHNS and C. A. GIBSON (*Jour. Dairy Res. [London]*, 13 (1944), No. 3, pp. 287-294).—As there was disagreement regarding cheese quality and yield as reported by Marquardt and Needham (E. S. R., 85, p. 245), further study was made of the relation of the milk to cheese quality. There was good agreement between the solids-not-fat content of the milk and the yield of the cheese. Abnormal milk may adversely affect either yield or quality of the cheese or both. Cheeses were made from these types of milk and from milk which showed evidence of mastitis, produced at different seasons of the year.

The influence of abnormal ("non-acid") milk on cheese starter cultures, G. J. E. HUNTER and H. R. WHITEHEAD (*Jour. Dairy Res. [London]*, 13 (1943), No. 2, pp. 123-126, illus. 1).—Delayed coagulation was caused by the growth of nonacid streptococci in the propagation of starter, simulating causes of failure resulting from bacteriophage. Starter cultures were very differently affected by the particular strains of streptococci present. Some were inhibited more than others.

The effect of over-ripening upon the activity of Cheddar cheese starters, C. K. JOHNS and H. L. BÉRARD (*Jour. Dairy Res. [London]*, 13 (1943), No. 2, pp. 127-135, illus. 3).—Overripening cheese starters to an extent greater than usually encountered in cheese factory practices failed to slow the rate of bacterial growth, acid development, or the final acidity reached. The overripened portion of a starter worked slightly faster in the vat and produced cheese with an increased flavor score. The three starters studied varied considerably in the effects of overripening on the proportion of rapid milk-coagulating organisms. More of these organisms were present in the overripened portion than when normally ripened. The flavor of cheese produced by overripened starter was superior to that of cheese normally ripened.

The production of rennet from living calves, N. J. BERRINGE, J. G. DAVIS, P. M. and S. K. KON, and F. R. SPRATLING (*Jour. Dairy Res. [London]*, 13 (1943), No. 2,

*pp. 145-161, illus. 8).*—Cheese made with fistula rennet from living calves was indistinguishable from control cheese. The fistula operation was performed on two calves. The mean yields of rennet for each perfusion in the two calves were 3,120 and 5,680 units, respectively. The abomasal juice was obtained by allowing calves to drink diluted whey and removing it from the rumen in about  $\frac{1}{2}$  hr through the fistula. The abomasal juice had a maximum proteolytic activity at pH 3-4. However, the time, labor, and cost of feed were too great to produce rennet economically by the fistula method.

Further studies on bacteriophage in relation to Cheddar cheese-making, C. K. JOHNS (*Jour. Dairy Res. [London]*, 13 (1943), No. 2, pp. 119-122).—A complete cessation of acid production in experimental vats is described. The source of the phage bringing this about was not definitely demonstrated. Testing for the phage indicated that it was influenced by the size of the milk sample examined and by refrigerated storage for 7-16 hr. before testing. Lysis of the dominant strains of the mixed culture of starters by phage caused slow working vats.

Extraneous matter tolerances in cheese, W. V. PRICE and R. MIERSCH. (Univ Wis.). (*Jour. Milk Technol.*, 7 (1944), No. 6, pp. 322-328, illus. 2).—Methods of eliminating much of the extraneous matter in cheese (E. S. R., 92, p. 411) were found practical and feasible, and reduction of critical extraneous matter could be accomplished without unduly increasing costs of manufacture. Some tolerance seems sensible.

Bacteriological studies of roller-dried milk powders, roller-dried buttermilk, and of roller- and spray-dried whey, C. HIGGINBOTTOM (*Jour. Dairy Res. [London]*, 13 (1944), No. 3, pp. 308-323).—In these studies of some 400 samples of dried milk products, the spray-dried products gave three times as many organisms on plate counts at 37° and 55° C. and three times as many positive presumptive coliform tests at all dilutions as did the roller-dried products. Roller-dried whey and buttermilk gave more variable counts at 37° and higher counts at 55° than roller-dried separated milk and roller-dried full cream milk. Marked differences were observed in plate counts from samples from different plants. Mold counts do not provide a reliable indication of recontamination. There was no correlation between the plate counts and titratable acidity or pH of the samples of either roller- or spray-dried whey. The keeping quality and plate counts of the roller-dried milks did not seem to be related. Cultures from the plates made from roller-dried products after incubation at 37° consisted chiefly of micrococci, sarcinae, and spore-forming bacilli. A few other organisms were present. A plate count not exceeding 5,000 per gram seems reasonable for high-quality products.

The gas-packing and storage of milk powder, C. H. LEA, T. MORAN, and J. A. B. SMITH (*Jour. Dairy Res. [London]*, 13 (1943), No. 2, pp. 162-215, illus. 14).—The influence of storage temperature and of oxygen and nitrogen gases on the development of off-flavors in milk powder over a storage period of 2-3 yr. was investigated in the following papers. The Prevention of Tallowiness (pp. 164-173), and The Technique of Inert Gas Packing (pp. 184-196), both by Lea and Moran; and Changes in Palatability (pp. 174-180), The Prevention of Loss of Solubility (pp. 180-184), and Further Observations of the Gas-Packing of Milk Powder, Including Data on Storage for Periods Exceeding Three Years (pp. 196-215), all by Lea and Smith.

The general conclusions from these studies indicated that the prevention of tallowiness is a major problem in the long storage of milk powder. Chemical tests of the fat extracted from milk powder showed that with the disappearance of free oxygen the tallowiness fell away to low levels. Observations on full-cream milk powder stored in nitrogen containing various concentrations of oxygen at 47° and 37° C. indicated that inert gases containing not more than 0.5-1 percent of oxygen

should prevent development of recognizable tallowy odors and flavors for an indefinite period. Nitrogen containing as much as 3-6 percent oxygen had marked effect in retarding the development of tallowiness. Solubility tests of whole and separated milk samples packed in air and in different concentrations of oxygen and stored at various temperatures showed that changes in solubility due to storage at ordinary temperatures for a number of years will be exceedingly slight with gas-packed powders of low moisture content. A procedure is described for reducing the oxygen concentration in cans of milk powder to any desired degree. Full-cream powder stored in the presence of increasing quantities of oxygen up to 0.01 cc. at both normal and high temperature levels kept well. Tallowiness was never definitely detected. Powder stored with 2 percent oxygen at 15° and 37° was usually but not invariably distinguishable from powder with lower combinations of oxygen at high temperatures.

## VETERINARY MEDICINE

**Viruskrankheiten. Zweiter teil, Die Viruskrankheiten der Haus- und Laboratoriumstiere ihre Erreger und ihre Bekämpfung [Virus diseases.—II, The virus diseases of domestic and laboratory animals, their causes and control], K. BELLER and R. BIELING (Leipzig: Johann Ambrosius Barth, 1942, pp. 237+).**—In this treatise, accounts of the various specific diseases are preceded by chapters dealing with pathogenic viruses, the characteristics of virus diseases, and passive and active immunization.

**Lehrbuch der Speziellen Chirurgie für Tierärzte und Studierende [Textbook on special surgery for veterinary surgeons and students], E. SILBERSIEPE and E. BERGE (Stuttgart: Ferdinand Enke, 1943, 10. ed., pp. 538+, illus. 411).**—This text is arranged to take up in turn diseases of the head, throat, breast, abdomen, fore-quarters, and hindquarters.

**Lehrbuch der Arzneimittellehre für Tierärzte [Textbook on pharmacology for veterinarians], E. FRÖHNER, rev. by R. RFINHARDT (Stuttgart: Ferdinand Enke, 1943, 16. ed., entirely rev., pp. 385+).**—The various classes of drugs and drug products are considered in turn.

**[Miscellaneous veterinary contributions] (U.S. Med., 40 (1945), No. 4, pp. 134-140, illus. 6).**—These include Topical Application of Sulfanilamide, by J. L. Davidson (pp. 134-136); A Practitioner's View of Respiratory Diseases of Adult Fowls, by W. E. Bowstead (pp. 137-138); and Observations on Canine Leptospirosis in Antigua, by L. R. Hutson (pp. 139-140).

**The newer sulfonamides in veterinary practice, W. T. S. THORP.** (Pa. Expt. Sta.). (Jour. Amer. Vet. Med. Assoc., 106 (1945), No. 815, pp. 75-82).—The results of toxicity studies on experimental calves given various dosages of sulfathiazole, sulfadiazine, sulfamerazine, sulfaguanidine, sulfasuxidine, and sulfathalidine are discussed briefly. Clinical observations on 61 cases of acute calf pneumonia are given, 33 treated with sulfathiazole, 12 with sulfadiazine, and 16 with sulfamerazine.

"Experimental studies and clinical observations indicate that sulfathiazole is less toxic and just as efficient as sulfadiazine for calf pneumonia. Sulfamerazine shows promise of being a useful drug for the veterinary practitioner. Clinical observations on its use for calf pneumonia are most encouraging. Further studies on sulfaguanidine have confirmed previous reports as to its efficiency for calf scours. It has proved useful in coccidiosis, both in poultry and livestock. Sulfaguanidine is more effective for coccidiosis than either sulfasuxidine or sulfathalidine."

"Toxicity studies on sulfathalidine showed favorable results, and, when used clinically on 75 cases of calf scours, it had a high therapeutic efficiency. Sul-

fatalidine and sulfaguanidine have produced good results based on clinical studies when used for enteritis in swine, both with and without a vitamin supplement. These two drugs appear to be the most practical for use in enteric diseases. . . .

"Studies on the various sulfonamides indicate that an increase should be made in the fluid intake of the body during their administration. Each sulfonamide has its limitation and should be used judiciously for the purpose for which it is intended."

Two dosage tables, based upon reports in the literature and extensive experimental investigations, are presented.

A comparison of the effect of penicillin and immune serum in the treatment of experimental leptospirosis in young white mice and in hamsters, C. L. LARSON and J. J. GRIFFITS (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 12, pp. 317-323).—Both penicillin and specific immune serum had a marked therapeutic effect on the disease produced by *Leptospira icterohaemorrhagiae* in young Swiss mice and by *L. canicola* in hamsters. As there employed, little choice as to efficacy between the two treatments was indicated.

The antimarial activity of tyrothrinicin against *Plasmodium gallinaceum*, L. G. TALIAFERRO, F. COULSTON, and M. SILVERMAN (*Jour. Infect. Diseases*, 75 (1944), No. 3, pp. 179-211, illus. 10).—It was found that the normal course of sporozoite- or blood-induced *P. gallinaceum* in small chickens given from 100,000 to 1,000,000 blood parasites or when bitten by 1 to 12 infected *Aedes* consists of an incubation period; an acute rise, during the high point of which 50 to 80 percent of the chickens may die; a crisis, extending over several days, which may be interrupted by one or more parasite increases; and, after 2 to 4 weeks, a long-continued low-grade infection for at least a year and a half (end of observations) during which slight relapses sometimes intervene.

Crude tyrothrinicin was found in these extensive experiments to be effective curatively against sporozoite- or blood-induced infections of *P. gallinaceum* if administered intravenously in a 9.5 percent alcoholic solution to chickens. It has been found to produce a predominantly parasiticidal effect, especially on the extra-cellular merozoites produced at segmentation, and to a less extent degenerating, and growth- and reproduction-inhibiting effects.

The in vitro metabolism of *Plasmodium gallinaceum*, M. SILVERMAN, J. CEITHAML, L. G. TALIAFERRO, and E. A. EVANS, JR. (*Jour. Infect. Diseases*, 75 (1944), No. 3, pp. 212-230, illus. 7).—This report deals with the glucose metabolism of *P. gallinaceum*.

The development of *Plasmodium gallinaceum* from sporozoite to erythrocytic trophozoite, C. G. HUFF and F. COULSTON (*Jour. Infect. Diseases*, 75 (1944), No. 3, pp. 231-249, illus. 2).—A technic for the study of the early development of malarial parasites in vertebrates is described. Using this method, results were obtained with chickens, of which a detailed account is presented of the stages in the life cycle of a malarial parasite which develop from sporozoites and ultimately give rise to the stages parasitizing erythrocytes.

The low toxicity in animals of boric acid as a preservative agent, D. V. FROST and R. K. RICHARDS (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 2, pp. 138-144).—Boric acid at from 0.5 to 1.5 percent in injectable solutions showed no toxic effects in rats and dogs when injected over long periods. Levels averaging about 400 mg. per kilogram body weight per day for 30 days did not affect the blood picture or deter the growth of rats. Levels from 60 to 70 mg. per kilogram appeared to have no effect on the estrus cycle. "Varying the level of chlorides in the diet did not appear to influence the toxicity of injected boric acid; however, it appears likely that other nutritional factors play a part in tolerance for this drug." The bacteriostatic effect of boric acid, from 0.5 to 1.5 percent, against selected bacteria and molds appeared satisfactory for preservation of certain injectable solutions.

Contribucion al estudio del ion hierro normal en la sangre de caballares y vacunos [The normal iron ion in the blood of horses and cattle], A. RAMOS VALDES ([Chile] *Agr. Téc.*, 4 (1944), No. 1, pp. 72-77).—Analyses are reported.

Blood picture of a cow during a normal pregnancy and parturition, P. G. D. MORRIS (*Vet. Jour.*, 100 (1944), No. 11, pp. 225-233, illus. 3).—Graphs and analyses are presented of the changes in the blood picture for a single animal.

The influence of intracutaneous injection of sonic filtrate of *Brucella abortus* on the blood-leucocyte picture of cattle positive to brucellosis, I. LIVE, E. L. STUBBS, and W. L. MACKEY, JR. (*Jour. Infect. Diseases*, 75 (1944), No. 2, pp. 170-174, illus. 1).—In these experiments, within 6 to 8 hr. after an intracutaneous injection of sonic filtrate of *B. abortus*, cows positive to brucellosis showed marked changes in the leucocyte picture of the blood. The most significant deviation was observed in the rise in the percentage of immature (one-lobed) neutrophiles, with the total white counts and the percentage of mature neutrophiles also showing considerable increases. The various cell components returned to approximately preinjection levels at the end of 48 hr. Cows negative to brucellosis when subjected to the same treatment with sonic filtrate of *B. abortus* showed only slight deviations which could be attributed to normal variation of the leucocyte picture.

Encephalitis in a heifer caused by a *Pasteurella* organism, H. E. KINGMAN (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 815, pp. 109-110).—The author reports a case of acute brain abscess as caused by a member of the *Pasteurella*, or hemorrhagic-septicemia, class of organisms.

Histopathology of enzootic bovine haematuria, P. J. G. PLUMMER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 8 (1944), No. 6, pp. 153-158, illus. 5).—This disease, discussed in 1913 by Kalkus (E. S. R., 30, p. 383), is endemic in local districts of British Columbia and causes considerable economic loss. A histopathological study is reported. Lesions are confined to the mucous membrane of the urinary bladder. Early damage results in hemorrhage and mild inflammation of the mucosa stroma. Later, vascular channels form in the hemorrhagic areas and finally develop to form hemangioma.

Studies on enzootic bovine haematuria: Effect of bovine blood on urinary bladder, P. J. G. PLUMMER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 2, pp. 49-50).—The possible influence of free bovine blood in the walls of the bladder as an exciting cause of hemangioma suggested experiments in which bovine blood was injected into the bladder wall of guinea pigs and calves. However, the blood did not appear to have the property of stimulating changes leading to hemangioma.

The use of a new phenanthridinium compound 1553 in the treatment of *Trypanosoma congolense* infection in cattle, J. CARMICHAEL and F. R. BELL (*Vet. Rec.*, 56 (1944), No. 51, pp. 495-496).—In experiments with Zebu cattle in Uganda, this compound was found to have a marked therapeutic action when administered subcutaneously.

Bovine tuberculosis: An attempt to eradicate the disease from two badly infected herds, A. L. CLAY and R. E. CHURCHWARD (*Austral. Vet. Jour.*, 20 (1944), No. 6, pp. 322-328).—Experience with these herds is detailed, illustrative of the difficulties of eradication based on frequent tuberculin testing as a basis of elimination.

The relationship of bovine to human tuberculosis considered in the light of experience, J. W. RAINES (*Vet. Jour.*, 100 (1944), No. 11, pp. 233-240).—Following a review of experience in various countries, the author argues that for serious human infection with tuberculosis of bovine origin, "there must be a high local potential incidence of bovine tuberculosis showing, by a tendency to generalization, a high virulence of the bovine bacillus," and that "the human subject of bovine

infection must, as a rule, be living in a relatively sunless humid environment favorable to mass infection. . . . Where these conditions do not obtain, that is where there is lots of sunshine, close cropping, plenty of animal food, no overcrowding, and a bovine tuberculosis either rare or of low virulence, as shown by a small tendency to generalization and by 'nonvisible lesions' at autopsy, then neither the cow nor its milk need be feared." A possible immunizing action of raw cow's milk under these circumstances is suggested.

A report on the occurrence of rickets in calves under farm conditions, J. W. HIBBS, W. E. KRAUSS, C. F. MONROE, and W. D. POUNDEN (*Ohio Sta. Bimo. Bul.* 232 (1945), pp. 3-8, illus. 4).—Case observations on nine Guernsey calves from 5 to 6 mo. of age.

An attempt to control "white scour" of calves with sulphaguanidine, P. S. WATTS and J. D. PATERSON (*Vet. Rec.*, 56 (1944), No. 51, p. 498).—This contribution from the Hannah Dairy Research Institute reports complete failure to effect a cure.

Some observations on the effect of sulfa drugs on blood plasma ascorbic acid levels in calves, N. S. LUNDQUIST and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 2, pp. 139-145, illus. 1).—Earlier studies (E. S. R., 91, p. 187) having indicated a relationship in calves between blood plasma ascorbic acid concentrations and certain active infections of the type reported to be relieved by sulfonamide therapy, further observations are presented. The method of Mindlin and Butler (E. S. R., 80, p. 728) was used in determining the blood plasma ascorbic acid values.

The results of these experiments indicate that succinyl sulfathiazole, when fed at the low level of 2.0 gm. per day to the newborn calf, was responsible for higher blood plasma ascorbic acid levels during the first week of life than those in untreated calves. No effect was noted when this drug was given at levels of 2, 10, or 15 gm. daily for 7 days to 8-9-month-old heifers. Sulfapyridine, at 10- or 15-gm. daily dose, did not appear to effect an increase in blood plasma ascorbic acid above normal. However, administration of the drug at the rate of 10 gm. daily for 7 days apparently increased subnormal levels up to, but not above, normal levels. Sulfathiazole, when fed at the rate of 15 gm. daily, definitely stimulated an increase in blood plasma ascorbic acid similar to that of chlorobutanol, but different in that it required a longer period to reach peak levels. Chlorobutanol, fed at the rate of 3 gm. daily for 7 days, increased blood plasma ascorbic acid levels. This chlorobutanol-ascorbic acid response was not interfered with by the previous use of succinyl sulfathiazole; but a marked reduction in ascorbic acid concentration occurred when the chlorobutanol feeding period was preceded by the feeding of sulfathiazole, even though there was an interval of 6 days between these two feeding periods.

The toxicity of the ripe fruit of blackbrush or tarbush (*Flourensia cernua*) for sheep and goats, F. P. MATTHEWS (*Texas Sta. Bul.* 664 (1944), pp. 16, illus. 2).—Serious losses in sheep and goats as a result of grazing the ripe fruit of *F. cernua* were observed in three ranches during the months of January and February. The characteristic pathological alterations were inflammation, ulceration, and perforation of the gastrointestinal tract due to the presence of some intense irritant. In all cases the animals had been subjected to considerable handling and were quite hungry when they gained access to the plant, and when sheep and goats have continuous access to the plant and are not subjected to handling during the winter months, no evidence was found that the fruit is grazed in sufficient amounts to cause toxic effects. The plant has not been associated with similar losses in cattle. The toxicity of the ripe fruit was further demonstrated by experimental feeding to sheep and goats. An acute inflammation of the abomasum and the first part of

the duodenum was produced, with death within 18 to 72 hr., or a serious illness for several days which was associated with ulceration of the abomasum. A marked variation in the susceptibility of different individuals was observed, as well as a narrow margin between a slightly toxic and a lethal dose of the material. Losses can be avoided by preventing hungry animals from gaining access to the plant during the winter months. There is no evidence that the green leaves constitute a hazard to livestock.

**Observations on the cyanogenetic properties of linseed "nuts," I, II** (*Austral. Vet. Jour.*, 20 (1944), No. 6, pp. 332-343, illus. 1).

I. *Feeding trials with sheep*, M. C. Franklin and R. L. Reid (pp. 332-337).—The "available" HCN content of several samples of linseed nuts and a sample of linseed oil meal used for stock feeding in Australia ranged from 48 to 62 mg. per 100 gm. When sheep were fasted for 5 days and then force-fed gruel, prepared from crushed linseed nuts, the consumption of sufficient gruel to provide 1.81 mg. or more of available HCN per pound of body weight proved fatal in every case. This represented an intake of 300 to 400 gm. of linseed meal by sheep ranging from approximately 80 to 100 lb. live weight. In other fasting experiments consumption of linseed nuts was never sufficiently rapid to lead to actual losses, although in several instances temporary symptoms of HCN poisoning were shown. The sheep used in these experiments had not been fed linseed nuts previously. Field evidence is included to show that consumption of linseed nuts by sheep which were used to this feedstuff could reach dangerous levels after fasting.

In practice, however, it would appear that there is little, if any, likelihood of unfasted sheep consuming sufficient linseed nuts to lead to harmful effects even when the available HCN content of the nuts is 50 to 60 mg. per 100 gm. of material.

Where linseed nut consumption was not too rapid, much larger quantities could be tolerated. For example, over a 24-hr. period, fasted sheep consumed sufficient to yield up to 5 mg. of HCN per pound of body weight without showing any harmful effects.

II. *Clinical syndrome in sheep*, D. C. Blood and J. D. Steel (pp. 338-343).—A clinical syndrome and autopsy findings in sheep after the ingestion of linseed nuts and force feeding on linseed nut gruel are described.

Histotoxic anoxia is suggested as the primary cause of death, the etiological agent being hydrocyanic acid. The possibility of nitrate or nitrite poisoning, or of water intoxication, as the primary etiological agent was eliminated, but stimulation of the vaso-vagal reflex resultant upon the inhalation of vomitus is suggested as a contributing or a precipitating cause of death. Two signs, namely, hyperesthesia and terminal vomiting, not previously recorded were observed. "Nystagmus has been noted previously, but the type exhibited has not been recorded. Though the train of circulatory symptoms is suggestive of a definite pattern, and such changes have not been previously recorded, confirmation is required before they can be accepted."

An experimental investigation of the cause of death of Merino rams after long journeys by rail, M. C. FRANKLIN and C. H. MACGREGOR (*Austral. Vet. Jour.*, 20 (1944), No. 6, pp. 328-331).—Fasting experiments, carried out to simulate conditions experienced during extended trucking, are described. It was found that short periods of starvation markedly depressed food consumption for a short period following the fast, so that during an extended journey fasting effects may become cumulative.

Fasting rams for 4 to 6 days resulted in a decline in the level of the serum calcium, in one instance to the extent of 43 percent.

Consumption, by fasted rams, of linseed "nuts," a byproduct of the linseed oil industry compressed into small cubes, resulted in several deaths, although rams not fasted consumed larger quantities without ill effects. These losses are attributed

to HCN poisoning. Generous supplementary feeding with good roughage-concentrate mixtures or good quality hay for 10 days before transit are recommended to minimize risk from fasting en route.

**Methods of controlling sheep ticks and lice,** H. H. SCHWARTZ and J. G. MATTHYSSE. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 11 (1945), No. 2, pp. 11-12, illus. 2*).—Tests are noted which showed the effectiveness of dipping with either rotenone or phenothiazine when obtainable. The possibility of replacements with substitute materials is also discussed.

**Preventing, curing stiff-lamb disease,** J. P. WILLMAN. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 11 (1945), No. 2, pp. 1, 7, illus. 1*).—Stiffness of lambs occurring in March or April was found to be of nutritional origin. The disease was greatly reduced when liberal amounts of wheat bran were added to a ration of alfalfa hay, oats, barley, and cull beans fed to the ewes, only 4 stiff lambs occurring among 68. Only 1 stiff lamb occurred among 76 when the ewes' ration included unextracted wheat germ meal. Vitamin E fed to lambs prevented the disease, but there were 13 stiff lambs among 27 not receiving the vitamin E supplement. Rapid recovery from the disease was produced in 6 of 7 treated subcutaneously with vitamin E. Of 6 untreated similarly fed lambs 5 died. These studies were based on about 800 lambs raised between 1930 and 1944.

**Svinens raktis, dess symptom och orsaker** (Swine rickets, its symptom and causes), N. E. NILSSON (*K. Lantbr. Akad. Tidskr., 83 (1944), No. 5, pp. 406-419; Eng. abs., p. 417*).—This is a review of existing knowledge, with a list of 44 literature references.

**An unusual case of genital involvement in swine associated with eating moldy corn,** J. S. KOEN and H. C. SMITH. (U. S. D. A. et al.). (*Vet. Med., 40 (1945), No. 4, pp. 131-133, illus. 2*).—Genital involvements noted in a herd of both gilts and barrows were ascribed to the feeding of moldy corn, and the substitution of corn free from mold was followed by apparently complete recovery within 5 mo.

**Contribucion al estudio de los metazoos parásitos del perro** [The metazoic parasites of the dog], J. ARIAS MARAMBIO ([Chile] *Agr. Téc., 4 (1944), No. 1, pp. 59-71*).—An extended study based on post-mortem and fecal examination.

**Panel discussion on poultry diseases** (*Jour. Amer. Vet. Med. Assoc., 106 (1945), No. 815, pp. 91-103*).—This is a transcript of the panel discussion at the 1944 meeting of the American Veterinary Medical Association.

**Differential diagnosis of respiratory diseases of fowl,** J. P. DELAPLANE. (Tex. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 106 (1945), No. 815, pp. 83-87*).—Means for the differentiation of laryngotracheitis, infectious coryza, infectious bronchitis, avian pneumoencephalitis, chronic coryza or bronchitis, endemic fowl cholera, coccobacilliform coryza, and infectious sinusitis of turkeys are briefly discussed.

**Specific diagnosis and chemotherapy of avian coccidiosis,** P. P. LEVINE. (Cornell Univ.). (*Jour. Amer. Vet. Med. Assoc., 106 (1945), No. 815, pp. 88-90*).—Means for distinguishing between *Eimeria acervulina*, *E. brunetti*, *E. necatrix*, *E. tenella*, and *E. maxima* are described, and coccidiostatic powers of sulfur and sulfaguanidine are discussed.

**Papillary cystadenomata of the gizzard of fowls,** A. B. WICKWARE (*Canad. Jour. Compar. Med. and Vet. Sci., 9 (1945), No. 2, pp. 34-37, illus. 2*).—An unusual type of tumor found in the gizzards of three crossbred fowls used for the study of transmissible leucosis is described.

**Effect of riboflavin deficiency on the course of *Plasmodium lophurae* infection in chicks,** A. O. SEEGER and W. H. OTT (*Jour. Infect. Diseases, 75 (1944), No. 2, pp. 175-178, illus. 1*).—Riboflavin deficiency exerted a marked influence on the course of *P. lophurae* infections in chicks. In contrast to biotin deficiency, however,

riboflavin deficiency decreased the severity of the acute infection as judged by parasite counts. The administration of riboflavin to deficient birds during the course of the infection increased the severity of the infection. Chicks receiving an adequate amount of riboflavin but whose food intake was restricted to one-half that of a control group developed an even heavier infection than did the controls. The mortality was relatively high in the deficient groups in spite of the fact that the parasite counts were much lower than in the birds receiving an adequate amount of riboflavin. This increase in mortality was due principally to the inanition associated with the riboflavin deficiency.

**Studies in pullorum disease.—IV, The effect of bacteriophage on regular and variant strains of *S. pullorum*, R. GWATKIN** (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 2, pp. 43-45).—Continuing earlier work by the author (E. S. R., 59, p. 583) and that of Younus (E. S. R., 85, p. 827), 16 strains of *Salmonella pullorum* were tested with a bacteriophage isolated from chicks which had died of pullorum disease, and from which regular strains of the organism had been isolated. Ten were of the regular and 6 of the variant type serologically. While the number was small, those strains examined were equally susceptible to the lytic agent if reasonable allowance be made for the vagaries of the last active dilution of a bacteriophage, and there was no indication that the serological types could be differentiated by bacteriophagy.

**Trials with various preservatives for pullorum antigen, E. W. BOND** (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 2, pp. 40-42).—In tests of sodium borate, thymol, sodium benzoate, merthiolate, sodium sulfathiazole, citrinin, cetavlon, and formaldehyde as substitutes for phenol, none proved satisfactory.

**Infectious laryngotracheitis vaccination in relation to the transmission of pullorum disease, C. J. R. GORRIE** (*Austral. Vet. Jour.*, 20 (1944), No. 6, pp. 343-344).—The method of vaccination by light scarification is discussed, together with precautions which have been found desirable to prevent undesirable infection as revealed by experiments. "We have shown that the usual vaccination technic could transit pullorum disease."

**So-called tick paralysis in chickens, M. W. EMMEL** (*Fla. Expt. Sta. Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 815, p. 108).—The author reports the observance of this disease in 14 flocks of chickens within the past 5 yr. and associated with infestations of the common fowl tick. Removal of these ticks from affected birds resulted in surprising recoveries, usually within 24 hr.

**An outbreak of cholera in turkeys, I. W. MOYNIHAN and J. C. BANKIER** (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 2, pp. 46-48).—Bacteriological findings and transmission experiments following an outbreak in a flock of turkeys in southern Alberta indicated that *Pasteurella avicapticus* was the causative organism. The organism recovered was pathogenic for two out of four chickens and for one turkey. The symptoms and cause of the disease differed from those in a natural infection.

**La pathologie des oiseaux [The pathology of birds], G. LESBOUVRIES** (*Paris: Vigot Frères*, 1941, pp. 568, illus. 563).—This is a comprehensive and extensively illustrated treatise, with many references to the literature.

## AGRICULTURAL ENGINEERING

**Surface water supply of the United States, 1943, parts 4, 8, 11 (U. S. Geol. Survey, Water-Supply Papers 974 (1944), pp. 224+, illus. 1; 978 (1944), pp. 280+, illus. 1; 981 (1944), pp. 413+, illus. 2).**—These papers record measurements of stream flow for the year ended September 30, 1943, No. 974 covering the St. Lawrence River Basin, No. 978 the western Gulf of Mexico basins, and No. 981 the Pacific slope basins in California.

Federal-State cooperative snow surveys and irrigation water forecasts for Columbia Basin, April 1, 1945 (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1945, pp. 27+, illus. 2).

California cooperative snow surveys (*Calif. Dept. Pub. Works, Div. Water Resources, Coop. Snow Surveys*, 1945, Feb., pp. 16+, illus. 1; Mar., pp. 16+, illus. 1).—The status on February 10 and March 10 is shown.

Nevada cooperative snow surveys, J. E. CHURCH and H. P. BOARDMAN. (Nev. Expt. Sta., U. S. D. A., et al.). (*Nev. Coop. Snow Surveys*, 1945, pt. 2, Mar. 1, pp. 20+; pt. 2, Apr. 1, pp. 29+).

Federal-State cooperative snow surveys and irrigation water forecasts for Oregon, April 1, 1945 (*U. S. Dept. Agr., Soil Conserv. Serv., and Oregon Sta.*, 1945, pp. 26+, illus. 3).

Federal-State cooperative snow surveys and irrigation water forecasts for Utah, April 1, 1945, G. D. CLYDE. (Coop. U. S. D. A. et al.). (*Utah Sta. Minn-eog. Ser. 317* (1945), pp. 9+, illus. 1).

Deep well irrigation in the Oklahoma Panhandle, W. N. McMILLEN ([*Oklahoma*] *Panhandle Sta., Panhandle Bul.* 64, rev. (1944), pp. 24+, several illus.).—Although irrigation was considered secondary to dry farming in the agriculture of this area when this bulletin was first published in 1939 (E. S. R., 81, p. 426), "interest in irrigation . . . has grown rapidly in the past 5 yr. as shown by increasing requests for irrigation information from this station." The supply of irrigation water in this area is comparatively great, though not inexhaustible, and its quality good to fair except where waters of high salinity are used in localities having poor natural drainage. The total cost of irrigation water on the station demonstration was approximately \$5 per acre-foot. The cost of leveling the land varied from \$3 to \$5 per acre.

The soils of the Panhandle are considered quite fertile and comparatively easy to level, although not all of them are suitable for irrigation. Areas in the Panhandle recommended by the U. S. Geological Survey as favorable for irrigation are briefly described. Alfalfa, row crops, and vegetables have proved to be profitable under conditions of the station irrigation demonstration.

Improvement of flood-damaged land in eastern Oklahoma, H. J. HARPER (*Oklahoma Sta. Bul.* 282 (1944), pp. 28, illus. 8).—This bulletin has been erroneously noted as Bulletin 267 (E. S. R., 92, p. 421).

The dynamic properties of soils.—IX, Soil porosity determinations with the air pressure pycnometer as compared with the tension method, F. A. KUMMER and A. W. COOPER. (*U. S. D. A. coop. Ala. Expt. Sta.*). (*Agr. Engin.*, 26 (1945), No. 1, pp. 21-23, illus. 3).—Paper VIII (E. S. R., 82, p. 262) of this series was concerned with the effects of plow form on scouring.

The instrument developed for the measurements here reported depends upon the pressure-volume relationships between two vessels intercommunicating through small copper tubing connected between the vessels to a mercury manometer and provided with a stopcock in the tubing bridge, so located that the vessel in which the soil sample is to be placed may be shut off from the other vessel and the manometer at will, the manometer and air-chamber side of the apparatus having been brought to a predetermined pressure (indicated by an electrical contact of a platinum electrode with the mercury column in the manometer). The sample chamber is connected into the system by opening the intervening stopcock and the volume of the sample determined from the change in the pressure. Manometer readings are calibrated in terms of sample volume by the use of water samples of accurately known volume.

When noncapillary porosities determined by the tension method were corrected for lack of saturation the data yielded by the two methods agreed well. The

principal advantage claimed for the air-pressure pycnometer is that of its much greater speed. A single determination of the volume of soil and water in a given soil sample, at any moisture content, may be made in less than 2 min. The volume occupied by air in the sample may then be determined by merely subtracting this volume from the total volume of the soil-sample cylinder. It is not necessary to saturate the sample, nor need measurements be confined to any particular moisture content. Thus it is possible to determine the pore space volume of a soil sample at the prevailing field moisture immediately after it has been brought to the laboratory. In order to correlate the results it is only necessary to base all values for a given soil on a standard or average moisture content.

**Quick-coupling safety hitch for tractors** (*Wisconsin Sta. Bul. 465 (1944)*, pp. 47-48).—An automatic hitch designed to enable the tractor operator to attach an implement simply by backing into it, without getting off the driver's seat, is noted. This device was made by modifying a hitch with which several makes of tractor plows are equipped, mounting this hitch on the tractor drawbar, and equipping the implements with rings instead of the clevis type of attachment.

**Seed scarifiers**, H. A. ARNOLD (*Tennessee Sta. Bul. 194 (1945)*, pp. 24, illus. 10).—Seed scarifiers of the hammer-mill, sandpaper-abrasive, pneumatic-grater, and abrasive-disk types were investigated, with special attention to the scarification of *Lespedeza sericea* seed and the improvement of the abrasive-disk scarifier.

The hammer mill either injured the seed excessively or was ineffective as a scarifier, although, at reduced speed, good hulling was secured without injury to seed. Sandpaper abrasives gradually wore smooth, with the result that hulling and germination percentages were indeterminate or varied, regardless of the type of scarifier. Constant renewal of the sandpaper to secure uniform results was impracticable. The pneumatic-grater machine was effective both as a scarifier and huller when it was run at 900 r. p. m. and was adjusted as recommended by the manufacturer. An improved abrasive-disk scarifier with a 12-in.-diameter grinder, or saw-gumming wheel, as the abrasive, run at 1,910 r. p. m. by a 1-hp. electric motor and constructed as illustrated and described, effectively hulled and scarified the seed and separated it from the chaff in one run through the machine. This type of scarifier produced light spots on the ends of the seed. The extent of the light spots, as well as the amount of green dust discharged by the cleaner and settling around the chaff, indicated the approximate degree of scarification. Sweetclover, *L. bicolor*, *L. sericea*, and buttonclover were scarified successfully, and annual lespedezas were hulled without injurious effects, according to germination and field tests.

Over scarification injured seed. Old seed was easily overscarified. In general, scarified seed deteriorated more readily in storage than unscarified seed. Improvement in stand of buttonclover seedlings was obtained by proper scarification of seed.

**Fire hazards relating to hybrid seed corn**, L. G. KEENEY (*Agr. Engin., 26 (1945), No. 2*, pp. 74, 76, illus. 1).—The first and most dangerous of the hazards observed in actual practice was that of a drier burner not provided with control to shut it off in the event of failure of the blower. Other driers had no thermostatic means for stopping the heating unit when the air blast temperature exceeds 110° F., and a fire which resulted in a loss of \$30,000 was traced to a failure to provide such controls. Fire risks of more or less serious character were found in methods of fuel storage, in space heating equipment, and in the use of buildings about the drying plants for the temporary housing of transient workers. Loss of the seed itself without fire loss or risk may occur if a drying temperature of 110° is exceeded for an appreciable length of time or if the drying temperature reaches 125° for even a very short time. Loss of viability of the seed may also result from exposure to freezing before drying or from excessive moisture, which gives rise to mold or other spoilage.

**Resistance of ear corn to air flow, C. K. SHEDD.** (U. S. D. A. coop. Iowa Expt. Sta.). (*Agr. Engin.*, 26 (1945), No. 1, pp. 19-20, 23, illus. 4).—The bin used in these tests at Ames, Iowa, was about 7 ft. square and high enough to permit testing a 12-ft. depth of corn. The floor was of plywood over joists and the walls of plywood inside of studding. Joints were caulked to make the structure practically airtight. The corn was supported on a floor of 1- by 4-in. boards spaced  $\frac{3}{4}$  in. apart, of which the top was 2 ft. above the plywood floor. Air was admitted into the space under the open floor through a box the full width of the bin provided with a baffle for checking air velocity and distributing air flow uniformly. Two lots of corn were tested, one containing husks, silks, and shelled corn as harvested by a mechanical picker, whereas the other was clean ear corn. Air flow rates of from 10 to 70 cu. ft. per minute were used. The pressure drop through the corn ranged from 0.002 to 2.66 in. of water (equivalent to wind velocity pressures produced by winds of from 2 to 74 miles per hour) and the depth of corn in the bin was from 2 ft. of either lot to 8 ft. of the unseparated and 12 ft. of the cleaned corn.

In clean ear corn and at the same pressure the air flow varied inversely with the square root of the depth. The ear corn being mixed with the husks, silks, and shelled corn included by the picker, pressure to produce a flow of 10 c. f. m. through a depth of 8 ft. was 0.088 in. of water, as against 0.010 in. in a like bin of clean corn. At the pressure of 0.25 in., the flow through 8 ft. of the mixed corn and trash was 18 c. f. m. as against 49 c. f. m. through the clean corn. On the basis of these data air flow per bushel of corn would be about the same in a crib 12 ft. wide filled with clean ear corn as in a crib 6 ft. wide filled with corn containing the usual amounts of foreign material.

**Various ways to save work in making hay, I. R. BIERLY.** ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 2, pp. 14-16, illus. 2).—This deals especially with the hay loader, buck rake, and pick-up bailer.

**Making hay with an automatic tying pickup baler, E. W. SCHROEDER and W. F. ACKERMAN.** (Pa. State Col.). (*Agr. Engin.*, 26 (1945), No. 1, pp. 27-28).—With hauls of 1 mile or more to be made, most of the hay was baled and stored with a crew of one man on the tractor, two on a wagon drawn behind the baler, one man hauling and two or three men at the storage, and one man tending the baler. The latter may not be required and often is not used, especially with an experienced crew. At 4 tons per hour this crew was able to bale and store hay at the rate of 1 ton per 2 man-hr., and on short runs 1 ton per 1.8 man-hr. To bale and place hay in storage as fast as it was baled required a minimum crew of six men. In some types of storage this would require a small elevator.

With reference to the influence of the moisture content, the results indicate that hay field-baled at 25 to 28 percent moisture should be tied as loosely as possible to obtain the best quality hay at this moisture content. At a density less than 8 lb. per cubic foot, a 16 by 18 by 36-in. bale weighs less than 50 lb. Hay baled so loosely is preferably stored where it is to be used because the bales will be too loose for additional handling after curing. Hay of from 25 to 28 percent moisture could be baled at 8 to 10 lb. per cubic foot without absolutely spoiling, but it showed signs of having heated while curing, and a temperature rise was, in fact, noted. While this hay was also graded No. 2, there was a slight faded appearance to the green color, called a slight scald by one of the judges. Most of this hay was dusty. The dairymen, however, said the dust was not objectionable and called the hay good quality. One bale in this group contained three small molded spots. These results indicate that hay of 25 to 28 percent moisture should be baled when, due to adverse weather conditions, there is a risk of losing the entire crop or a considerable portion of its nutritive value. The bale density should be below 8 lb. per cubic foot, how-

ever, if the best quality hay is to be obtained. When the moisture of the hay was below 25 percent as baled, at a density of from 8 to 10 lb. per cubic foot, the green color of the hay was retained. At this moisture content and density the bales withstood a reasonable amount of handling even after being cured. Baling hay too dry, while few leaves were lost, tended to separate the leaves from the stems and also to break up the stems, the result being a chaffy hay.

**Mow-drying of hay shows promise** (*Wisconsin Sta. Bul. 465 (1944), pp. 45-47, illus. 2*).—Chopped clover hay of 45 percent initial moisture content was piled 6.5 ft. deep over wooden air ducts and dried to 10 percent moisture content in 8 days by air driven by a 20-hp. gasoline engine fan, at a cost of \$1.68 per ton (dry weight). It is believed probable that a layer of 8-10 ft. could have been dried at one time without any difficulty and that the cost of mow-drying hay with efficient systems usually will not exceed \$1.50 a ton. There was no spoilage, and the hay was "of as good quality as could possibly be expected, considering that it was both weedy and somewhat overmature when harvested."

**Relation of mechanization to farm structures**, F. J. REYNOLDS (*Agr. Engin., 26 (1945), No. 1, pp. 16, 18*).—The author holds that farm mechanization has altered, in some instances markedly, the functional requirements of farm buildings and that building design was lagged behind the changed requirement pattern. Also, "many of us believe that if farm structures had kept pace with farm machinery the contribution which the farmer could have made in this time of national crisis would have been still greater." As illustrations of his contention of a mechanization which has forced structural change or growth, he cites the development of the silo brought about by the silage cutter, the one-story barn made possible by the hay baler, new-type storage bins brought into use by the grain combine, etc. Barn curing of hay is mentioned as an example of mechanization, presenting a need not yet met by a new type of building, but "it is altogether probable that some new type of farm structure will be developed to facilitate this process."

In urging increased attention to farm building research, the author acknowledges that much has already been done by the U. S. Department of Agriculture and by the State agricultural colleges and experiment stations but points out that the total expenditure of these agencies for such work is now only \$200,000 per year, or 0.02 percent of the appraised value of the Nation's farm buildings. Concerning farm structure problems still awaiting study, the author presents four generalized questions together with the examples of specific questions concerning the functional requirements of special types of farm buildings which also can be answered only by research. Samples of such specifically directed questions are: For housing livestock, (1) how much space does a dairy cow need, (2) what is the optimum temperature for a dairy cow, and (3) what effect does relative humidity have on a cow's health? For grain and food storage, (1) how much pressure from stored grain must a bin resist, (2) what temperature must be maintained for storing potatoes, and (3) how much air movement is needed to dry grain properly?

Two further and similar groups of questions concerning the farm home and concerning any farm building are also included in this illustrative list. In order that answers to these and similar questions may be ready when brought up by farmers undertaking to rehabilitate our farm buildings to a state of efficient operation, the author believes that more complete information on the functional requirements of farm buildings should be attained by a research program carried out by Federal and State agencies.

**Shall the farmer be encouraged to continue doing his own construction work?** J. L. STRAHAN (*Agr. Engin., 26 (1945), No. 1, pp. 25-26*).—The author is of the opinion that farmers can no longer afford to do necessary building, even if they have the time; that they do not have equipment necessary to do it well; and that

they are not mechanically qualified to get the full benefit from their building investment. He presents economic and other data and argument in support of this view.

**Functional requirements in designing dairy barns,** T. A. H. MILLER, G. L. EDICK, W. ASHBY, J. R. DAWSON, and T. E. WOODWARD (*U. S. Dept. Agr. Cir. 722 (1945)*, pp. 24, illus. 5).—This circular presents a summary of present-day opinions of dairy and building specialists of the State agricultural colleges and of the Department, on the design of buildings for dairy cows. Some of the principal topics taken up are the dairy cow and her habits; distribution of dairy cows in the United States; general considerations (including building requirements as modified by climate, local and State health regulations, location of the dairy barn, and systems of stabling dairy cows); stall-barn design; milking-room and lounging barn combination; feed storage; silos; water supply; litter disposal; and lighting.

**Door and window design to eliminate heat loss in dairy barns,** W. C. KRUEGER. (*Rutgers Univ. (Agr. Engin., 26 (1945), No. 1, pp. 24, 26)*).—Because of very frequent neglect of detail in the door and window construction in barns otherwise well built, air leakage through and around these parts of the building, especially in masonry walls, is often found.

With respect to window construction, the author feels that there should be a double 2 by 6 for header and base. In the case of masonry walls, a jamb key should be fitted to the frame and imbedded in the wall and the window sill and the inside sloping stool set on a soft mortar fill so as to close all joints effectively. A step-construction jamb provides a solid stop for both the window and the storm sash as they are inserted from the inside of the barn. Equally tight construction in frame walls is accomplished by lap construction of the frame members. Window and casing construction which will prevent any direct passage of air through any part of the frame construction is outlined. By V-notching the bottom rail of the inside windows to fit the outside edge of the sharply sloping stool, condensation on the inside surface is directed into the barn while rain or other moisture on the outside continues in that direction.

Doors permit heat leakage, not only through poor fit but by air conduction through relatively thin material. Insulated doors need not be clumsy or crude-looking. A door of solid construction and having fair insulation properties can be built by using matched lumber, placed diagonally or vertically, outlining this with a frame and cross members of 6-in. board, filling the panel spaces so formed with rigid insulation board, and, after covering both sides with vapor-resistant paper, finishing the door with sheathing of hard-pressed composition board or thin cement-asbestos sheets. This door will be heavy and needs good hinge support, but will stand use.

**The agricultural engineer's interest in farm food processing,** G. W. KABLE (*Agr. Engin., 26 (1945), No. 1, pp. 11, 15*).—Taking the freezing preservation of foods as an illustration, the author holds that generally the food specialists should give the engineer the desirable holding temperature, the necessary rate of freezing, and the permissible fluctuations; and the economists should indicate size of equipment needed. The engineer's job is to design and build a freezer reasonable in first cost, economical in operation, reliable, easily operated and maintained, of a size and shape or type of knock-down construction to go through doors to the place of use, and designed with sufficient residual cold capacity to carry over expected outages in electric service without spoilage. These requirements involve a choice of structural materials, type and amount of insulation, type of cooling coils or plates, the use and size of eutectic tanks, the design of a single or multiple compartment cabinet with side or top openings, prevention of frosting or provision for defrosting, an economic balance between insulation thickness, eutectic

tanks or plates, and compressor size, controls, finish, and due consideration to the place in which the equipment is to be used. From the standpoint of manufacture and salability the engineer must also give consideration to ease and cost of fabrication, shipping weights, installation costs, and subsequent service. These matters constitute a field of interest in the farm freezer which is legitimately that of the agricultural engineer; the problems of design of compressors, controls, refrigerants, insulating materials, and other parts being left to mechanical, chemical, and electrical engineers.

In less detail the author indicates also the agricultural engineer's part in the suitable mechanization of butchering, poultry dressing, butter and cheese making, cooling of market milk, pasteurization, dehydration, and preparation equipment for processing.

## AGRICULTURAL ECONOMICS

[Studies in agricultural economics and rural sociology by the Wisconsin Station]. (Partly coop. U. S. D. A.). (*Wisconsin Sta. Bul.* 465 (1944), pt. 1, pp. 1-6, 8-11, illus. 2).—The following findings are reported in an investigation of the labor problems in Lowell Township, Dodge County, where a majority of farmers were making efficient use of their labor. On the basis of a schedule of the U. S. Department of Agriculture of work units for different enterprises, the number of units per man-equivalent ranged from 21.8 for farmers employing single men to 23.4 for those employing practically no help; 40 percent of the farmers used temporary help in haying, 59 percent in grain harvesting, and 53 percent in corn harvesting; and of the 319 farmers studied, 126 had less than 20 work units per man equivalent and 61, 16 units or less. Studies brought out that only 12 percent of Wisconsin farmers now have regular hired help and even on farms of 100 acres or more of crops, only 25 percent have hired men; only 6 counties had increased in population from April 1, 1940, to March 1, 1943, while 22 decreased 7 to 15 percent, 16 from 15 to 20 percent, and 9 more than 20 percent. A survey of farm land prices showed an increase of about 50 percent since Pearl Harbor.

A comparison of neighborhoods and communities in Dane County in 1941 with data gathered in 1921 and 1931 showed there are now 80 percent as many neighborhoods as in 1931, but of the 76 neighborhoods 72 were active in 1931 and 59 in 1921; that an active neighborhood can tolerate about 28 percent tenancy among its farmers; that where more than 50 percent of the families have lived in the neighborhood at least 25 yr. the chance of its remaining active is better than with more rapid turnover of the population; and that neighborhoods with at least 36 percent of mixed or indefinite nationality backgrounds are more likely to remain active. A survey brought out that in the southern two-thirds of the State the most common acreage of crops per farm is 60 acres as compared with 35 to 50 acres in the northern third. Information gathered regarding the Coon Valley conservation area showed that in 1934 and 1935, the first years of the conservation program, farm yields were well above the average of the counties; and that from 1936-39, inclusive, the soil conservation farms showed no marked or consistent advantage in crop production but for 1940-43, inclusive, the annual crop indexes were 116, 126, 140, and 142 as compared with 104, 100, 106, and 110 for LaCrosse and Vernon Counties.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul.* 232 (1945), pp. 34-35, 36).—Included are a brief statement by R. W. Sherman, on Ohio Cold Storage Locker Plants, as to the number, date of starting, location, and capacity of lockers; and a continuation of the index numbers of production, prices, and income, by J. I. Falconer.

Current Farm Economics [February 1945] (*Curr. Farm. Econ.* [Oklahoma Sta.], 18 (1945), No. 1, pp. 22, illus. 2).—Included are the usual review of the agricultural

situation (pp. 3-10), the tables of prices and price indexes (pp. 20-22), and articles on Will Wartime Agricultural Production Be Maintained? by L. J. Norton and E. L. Sauer (pp. 11-14), and Prices Paid by Oklahoma Gins for Cottonseed in 1944-45 Season, by A. L. Larson (pp. 15-19).

[Papers on agricultural economics] (*Jour. Amer. Soc. Farm Mgrs. and Rural Appraisers*, 8 (1944), No. 2, pp. 88-132, illus. 2).—Included are the following papers: Wartime Changes in Farm Production and Their Effects on Farming After the War, by S. E. Johnson (pp. 88-96) (U. S. D. A.); Economic Change—Technological Progress and Farm Management, by E. C. Young (pp. 97-102) (Purdue Univ.); Observations on Matters That Interest Canadian Farmers, by J. F. Booth (pp. 103-107); Maintaining Production in Eastern Agriculture, by S. W. Warren (pp. 108-112) (Cornell Univ.); Clinicizing the Farm, by C. M. Long (pp. 113-123); Postwar Markets for Farm Products, by O. B. Jesness (pp. 124-126) (Univ. Minn.); "All Out" Production—Postwar Fears—Reconversion Plans, by E. R. Morrison (pp. 127-129); and Successful Farmers, by R. L. Adams (pp. 130-132) (Univ. Calif.).

Abstracts of dissertations presented by candidates for the degree of doctor of philosophy, autumn quarter, winter quarter, 1943-44 (*Ohio State Univ., Abs. Doctoral Diss.*, No. 44 (1944), pp. 81-89, 201-208).—Included are theses presented by candidates for the degree of doctor of philosophy at the autumn quarter 1943 and the winter quarter 1944, as follows: The Growth and Distribution of Population in South Carolina, by J. J. Petty (pp. 81-89); and Adjustments in Land Use at the Extensive Margin of Farming in Ohio, by J. H. Sitterley (pp. 201-208).

[Articles in English on agricultural economics and statistics and rural sociology] (*Internat. Rev. Agr.* [Roma], 34 (1943), Nos. 1, pp. 1E-30E, 1S-16S; 2, pp. 37E-47E, 47E-70E, 70E-79E, 33S-45S, 46S-47S, 68S-88S; 3, pp. 81E-115E, 89S-95S, 95S-102S, 124S-126S; 4, pp. 117E-127E, 128E-156E, 156E-164E, 127S-138S, 158S-164S; 7-8, pp. 231E-275E, 255S-276S, illus. 1; 9, pp. 281E-307E, 305S-316S, 336S-348S; 10, pp. 311E-339E, 340E-342E, 349S-361S, 379T-397T; 11-12, pp. 343E-385E, 369S-384S, 385S-394S, 395S-405S; 35 (1944), No. 1-2, pp. 1E-22E, 22E-32E, 1S-13S, 14S-24S, 25S-34S).—Included in these pages are the following articles (usually signed), in addition to information in each number on vegetal production and current information by countries on field crops, livestock, livestock products, prices, etc.:

*Vol. 34, No. 1.*—The Economic Importance of the Various Size Groups of Farms in European Agriculture, by M. Tcherkinsky (continued in No. 2 below); and Cereals Growing in Europe, by V. Dore.

*Vol. 34, No. 2.*—Compulsory State Hail Insurance in Bulgaria, by C. Rommel; The Economic Importance of the Various Size Groups of Farms in European Agriculture, by M. Tcherkinsky; Switzerland [Agriculture], by A. Borel; Yields of Cereals in Europe, by V. Dore; World Linseed Production in 1942-43, by A. Di Fulvio; and Statistics on African Forests and Woods, by J. P. van Aartsen.

*Vol. 34, No. 3.*—The Small Holding—Its Creation and Problems, by G. Costanzo; Yearly Fluctuations of Cereals Yields in Europe, by V. Dore; The Evolution of the Cocoa Market, by W. Schubring; and Migratory Agricultural Labourers in Hungary in the Year 1941, by V. Desmireanu.

*Vol. 34, No. 4.*—The Social Structure of the Population Gainfully Occupied in Agriculture in Various Countries According to the Results of the Occupation Censuses, by H. Böker; The Cost of Insurance in the Budget of Agriculture, by W. Rohrbeck; Rumania [Agriculture], by N. D. Cornăteanu; Cereal Production in Europe, by V. Dore; and The Uniform and Permanent Regulation of Agricultural Production and Compulsory Delivery of Agricultural Products in Hungary, by V. Desmireanu.

*Vol. 34, No. 7-8.*—The Influence of the Intensification of Farming on the Returns of Agriculture, by J. Deslarzes; and Oleaginous Cultures in America—Efforts To Develop Them, by I. Grinenco (continued in No. 9 below).

*Vol. 34, No. 9.*—Depopulation of the Highland Areas in Italy, by U. Giusti; Oleaginous Cultures in America—Efforts To Develop Them, by I. Grinenco (continued in No. 11-12); and Soil Cultures, Vegetal Production, Livestock Rearing, and Animal Production in Denmark Since 1938.

*Vol. 34, No. 10.*—The Role of the Savings Banks in the Financing of Agriculture, by G. Costanzo; Spain—Note Concerning the Organization and Special Mission of the National Institute of Internal Colonization; Wartime Agriculture in Switzerland; and Observations on the Necessity of Health Improvement Along the Rural Population, by E. Lelesz.

*Vol. 34, No. 11-12.*—The Development of Agricultural Economics Research in the United States, by S. von Frauendorfer; Oleaginous Cultures in America—Efforts To Develop Them, by I. Grinenco (continued in Vol. 35, No. 1-2 below); Agriculture in Ireland During the War; and Agriculture in Slovakia.

*Vol. 35, No. 1-2.*—Depopulation of the Highland Areas in Switzerland and the Economy of the Highlands, by W. Ryser; Agricultural Labour Communities in South-Eastern Europe, by O. von Frangeš; Classification of the Territorial Area of the Different Countries From the Point of View of Agriculture, by V. Dore; The Evolution of Sugar Economy in the Interval Between the Two World Wars, by E. Romolini; and Oleaginous Cultures in America—Efforts To Develop Them, by I. Grinenco.

[Articles in French on agricultural economics and statistics and rural sociology] (*Rev. Internat. Agr.* [Roma], 34 (1943), Nos. 5, pp. 177E-203E, 171S-181S, 202S-214S; 6, pp. 207E-236E, 215S-234S, 255S-262S).—Included in these pages are the following articles, in addition to information in each number on vegetal production and current information by countries on field crops, livestock, livestock products, prices, etc.: No. 5—Production et Consommation des Huiles et Graisses Comestibles en Suisse [The Production and Consumption of Fats and Oils in Switzerland], by H. Böker (pp. 177E-191E); Situation et Possibilités d'Evolution de l'Agriculture en Turquie [Situation and Possible Evolution of Agriculture in Turkey], by K. Köylü (pp. 191-203E); La Production Mondiale du Café [World Production of Coffee], by A. Di Fulvio (pp. 171S-181S); L'Agriculture en Suède d'Après le Recensement Général Agricole de 1937 et Autres Recherches Statistiques Complémentaires [Agriculture in Sweden After the 1937 Census, and Other Statistics], by M. O. Grönlund (pp. 202S-214S); No. 6—L'Assurance-Grêle et sa Gestion en Suisse [Hail Insurance in Switzerland], by C. Rommel (pp. 207E-236E); Le Commerce Mondial du Café [World Trade in Coffee], by A. Di Fulvio (pp. 215S-234S); and L'Agriculture, l'Horticulture, et l'Elevage du Bétail aux Pays-Bas de 1938 à 1942 [Agriculture, Horticulture, and Livestock in the Netherlands, 1938-42] (pp. 255S-262S).

The relative efficiencies of groups of farms as sampling units, W. A. HENDRICKS. (N. C. Expt Sta. and U. S. D. A.). (*Jour. Amer. Statis. Assoc.*, 39 (1944), No. 227, pp. 366-376, illus. 8).—"The theory of grouped sampling units as applied to farm surveys is discussed from the viewpoint of subsampling and from the viewpoint of an empirical law developed by agronomists. The latter seems to provide the more logical basis for statistical analysis of data involving groups of neighboring farms as sampling units. The use of subsampling theory apparently introduces no serious errors if it is properly used, but the nature of the approximations involved in its application must be borne in mind. The empirical law developed by Fairfield Smith<sup>2</sup> does not appear adequate for predicting the variability of group averages for farm-survey data; the empirical formula used by Jessen [*E. S. R.*, 38, p. 111]

<sup>2</sup>*Jour. Agr. Sci.*, 28 (1938), No. 1, pp. 1-23.

for establishing a relationship between group size and variability within groups leads to much more satisfactory results. The newer theory is just as easy to use as subsampling theory and is free from some of the approximations involved in that theory. Subsampling theory seems to lead to results of fair accuracy so long as the range of group sizes considered does not depart too widely from the group size used in the analysis of variance upon which the computations are based. The use of the newer theory permits extrapolation over a wider range."

Information basic to farm adjustments in the High Plains cotton area of Texas, A. C. MAGEE, C. A. BONNEN, and B. H. THIBODEAUX. (Coop. U. S. D. A.). (*Texas Sta. Bul.* 652 (1944), pp. 81, illus. 12).—This second bulletin of the series (E. S. R., 81, p. 292) deals primarily with production and production requirements, how they are affected by changes in the combination of enterprises and production practices, and the probable effects of the changes on farm earnings. The earlier data are supplemented by soil maps prepared by the U. S. D. A. Soil Conservation Service in 1936, surveys in 1938 and 1940 of adjustments made due to the use of motorized equipment, and the later adjustment of the data to changes resulting from the introduction of the combining of grain sorghum. The procedures followed in the study are described in the first bulletin. The area, its soils, topography, soil and moisture conservation, weeds, insects, and plant diseases are discussed briefly. The adaptability of cotton, grain sorghums, Sudan grass, and wheat to the area is discussed, with tables and charts showing labor and power requirements and their monthly distribution, material requirements, production, etc. Amounts of feed fed work stock, costs of horse and tractor work with different sized outfits, and typical alternative systems of farming before the Agricultural Adjustment Administration and within the limitations of its program, and adjustments under wartime conditions are discussed. Budget analysis is made of the four most common farming systems prior to the activities of the A. A. A. and four alternative systems with A. A. A. limitations and requirements.

Under usual conditions the hours of preharvest labor required per acre for cotton were 10.45 with single-row and 6.65 with two-row horse machinery, and 5.5 hr. and 4.3 hr. with two-row and four-row tractors, respectively. The average costs of maintenance per day of uses were: A work animal, \$1.04; two-row tractor, \$5.15; and four-row tractor, \$8.25. The optimum acreage for an average farm family with a full cotton acreage is estimated as 100 acres with one-row, and 180 with two-row horse equipment, and 250 and 450 acres, respectively, with two- and four-row tractor equipment. With improved combines and grain sorghums suitable for combining, 1.8 hr. of labor per acre were needed for harvesting as compared with 4.45 hr. when the sorghum was hand-headed. With the stripper type of cotton harvester developed by the station, 2 men with a two-row machine can harvest as much cotton per day as 14 to 16 men by snapping. The budget analysis gave estimated labor and management wages for the most common systems before the A. A. A. as follows: Cotton, \$1,996; cotton-grain sorghum-livestock, \$1,184; grain sorghum-livestock, \$479; and cash grain, \$272. With the various systems to use pasture and forage production of soil-conserving crops, the estimated wages with 1942 prices were: Swine (7 brood sows)-diary (10 dairy cows)-poultry (100 hens), or swine (5 brood sows)-dairy (10 dairy cows)-poultry (500 hens), \$3,630; beef cattle (50 calves), \$2,774; and cash-feed system, assuming land is available to permit reasonably complete use of operating capital without great change in the farming system, \$3,217. The estimated labor and management wage with maximum mechanization—four-row tractor equipment for preharvest operations and mechanical harvesting of cotton and grain sorghums—is \$6,899.

Inter-farm relationships in the Frankfort, Kansas, community, C. P. BUTLER and H. J. MEENEN. (Coop. U. S. D. A.). (*Kansas Sta. Agr. Econ. Rpt.* 26 (1945),

pp. 24+, illus. 4).—"This report presents a picture of the variability of farming in one of the older farming communities in Kansas with special reference to the importance of interfarm relationships. It shows the extent to which farms supplement each other through the exchange of feed, livestock, labor, and machinery, and how this exchange is related to differences in size and type of farm." While the study was made in 1941, it is considered more indicative of the postwar community situation than a study during the war period.

**Postwar problems and programs for Ohio agriculture, J. I. FALCONER ET AL.** (Coop. U. S. D. A. et al.). (*Ohio State Univ. and Sta., Dept. Rural Econ. Mimeoq. Bul. 174* (1944), pp. 81+).—This is the report of a committee consisting of representatives of the following organizations: Ohio Agricultural Experiment Station, Ohio State College of Agriculture, Ohio Forestry Service and Nutrition Committee, U. S. D. A. Soil Conservation Service, Forest Service, Farm Security Administration, Agricultural Adjustment Agency, and Rural Electrification Administration.

**Foreign Agriculture [April 1945] (U. S. Dept. Agr., Foreign Agr., 9 (1945), No. 4, pp. 49-64, illus. 5).**—Articles on Iceland's Agriculture, by K. J. Friedmann (pp. 50-54) and The New Jute-Production Industry of Brazil, by C. M. Protzman (pp. 55-64) are included.

**Farm mechanization: Power costs and production requirements in the Northern Coastal Plains, H. B. JAMES and F. D. BARLOW, JR.** (Coop. U. S. D. A.). (*North Carolina Sta. Bul. 348* (1944), pp. 26+, illus. 2).—The data were obtained from a random sample of 61 highly mechanized farms in Halifax County and vicinity for 1943, supplemented by information from 128 nonmechanized farms for 1941 and adjusted for the price changes from 1941 to 1943. Analysis is made of the costs of operating small, medium, and large tractors with heavy and light loads; of combines, peanut pickers, and other tractor-drawn machinery; of work stock and equipment; and also of the labor and power requirements for cotton, peanuts, corn, soybeans, and small grains.

The average costs per hour, exclusive of driver, taxes, and shelter, of operating different sized tractors were: Small, 47 ct.; medium, 54 ct.; and large, 67 ct. The cost, all tractors, was 54 ct., for average loads; 48 ct., with light loads; and 60 ct., with heavy loads. For medium-size tractors the cost was 61 ct. when operated less than 800 hr. per year, and 50 ct. with over 1,000 hr. The average investment for tractor-drawn machinery was \$10.73 per acre exclusive of cover crops. The average annual costs exclusive of labor were \$178.06 for 6-ft. combines and \$115.60 for peanut pickers. The average cost for other tractor-drawn machinery was 18 ct. per hour or 65 ct. per acre. The average net cost per year of keeping work stock exclusive of taxes and shelter was \$185.87 per head, and the average time worked, 800 hr. Work stock equipment cost averaged 2.2 ct. per hour of use. On the basis of average work performed, a medium-size tractor could have replaced approximately six mules.

**Number and duty of principal farm machines, A. P. BRODELL and M. R. COOPER** (U. S. Dept. Agr., Bur. Agr. Econ., 1944, F. M. 46, pp. 58+).—Tables show by States the estimated number of different machines and implements, January 1, 1942, and 1945; the average size and age, January 1, 1942; average time used and work per 10-hr. day in 1941; and by State groups the estimated number of machines, January 1, 1942, to 1945.

**The use of surplus war cargo planes to transport agricultural perishables, R. W. HOECKER, R. K. WALDO, and L. H. BRITTIN** ([Washington, D. C.]: *Edward S. Evans Transportation Res.*, 1945, pp. 17+, illus. 4).—This is a joint study of the Edward S. Evans Transportation Research and the U. S. Department of Agriculture of how the extra potential carrying capacity of surplus transport planes of the Armed Forces will fit into the present national transportation system and

how these planes can contribute to the services rendered the public by growers and distributors of fresh fruits and vegetables.

**Surplus war cargo planes to move food**, R. W. HORCKER and L. H. BRITTIN (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Situation*, 29 (1945), No. 3, pp. 14-18, illus. 2).—The potential plane capacity, the contract carrier method, interchange of products, markets over 750 miles distant, and the potential volume of produce are discussed briefly.

**Some factors to be considered in the location of Ohio's livestock markets**, G. F. HENNING (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mineog. Bul.* 175 (1944), pp. 61+, illus. 15).—The livestock production and amount of livestock marketed; the present marketing structure; marketing charges, margins, and commissions; the size of markets; mileage involved in concentration of livestock; the motor and railroad rates; the farmers' reasons for selection of markets used; the effects of competition and prices of addition or removal of markets; etc., are discussed. On the basis of the findings the optimum sizes, types, and locations of markets are discussed. State maps show the suggested locations with the competitive and highly competitive areas for markets to handle volumes of 100,000,000 lb. or more, 50,000,000 lb. or more, and 25,000,000, lb. or more of livestock annually.

**Cotton marketing margins**, L. D. HOWELL (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Situation*, 29 (1945), No. 3, pp. 18-22, illus. 1).—Included is a brief discussion of the present and probable postwar cotton situation, the competition of cotton with other fibers, marketing channels, and the approximate distribution, 1939, of the consumer's dollar paid for cotton apparel and household goods.

**Cooperative feed distribution in the New Orleans farm credit district**, L. F. RICKY (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt.* 76 (1945), pp. 46+, illus. 26).—Types of farming in the district, the feeds purchased, cooperative purchasing, reasons why farmers should operate cooperative feed mills, advantages and limitations of large and of small mills, and factors essential to successful operation are discussed and appraisal made of the cooperatives now handling feed. Suggestions are made for the guidance of associations contemplating entering the feed manufacturing business, and some data are given as to cost of building feed mills and the costs of operation and savings per ton in cooperative mills.

**Co-operative credit societies in the South Caribbean Area**, A. R. STANTFORTH (*Trop. Agr. [Trinidad]*, 21 (1944), No. 12, pp. 219-227, illus. 2; 22 (1945), No. 1, pp. 3-8).—Included are a general history of the Trinidad and Tobago Government-financed societies, Usine Ste. Madeleine societies, and British Guiana societies; the cost of organizing credit; and the present organization and method of working in each group. Examination is made of the principles and methods of each group and recommendations made for West Indian credit societies.

**Cotton-hog farming on the Sand Mountain**, R. C. CHRISTOPHER and K. B. ROY (*Alabama Sta. Cir.* 91 (1945), pp. 20, several illus.).—The results obtained, 1938-43, on a 96-acre farm operated by the station to put into practice a complete system that would supplement cotton income form the basis of the circular. The cropping system and hog production are described and the returns analyzed.

The average net returns per year were \$569.81 for 1938-40 and \$3,169.08 for 1941-43, exclusive of the value of foods supplied by the farm. The net return for the period was practically double what there would have been if only cotton had been grown under the A. A. A. program.

**A farm management study of 91 dairy farms in the vicinity of Milton, Vermont, 1942**, S. W. WILLIAMS (*Vermont Sta. Bul.* 519 (1945), pp. 19, illus. 3).—Analysis is made of the farm organization, price conditions, expenses, returns, labor income, etc., of 91 farms and of the effects on income of production per cow, size

of business, labor efficiency, and capital efficiency. On the basis of this and other studies, the following appear necessary for efficient and profitable operation: A farm business of 650 or over man-hour units; 30 or more cows where all or the greater part of the income is from the dairy; annual production of at least 6,500 lb. of 4 percent milk or its equivalent per cow; 325 or more man-work units per man; a capital investment of not more than \$20 per man-work unit or \$450 per cow on farms without important nondairy enterprises; and less than two-thirds of the capital in real estate.

**Managing the dairy herd for greater returns,** T. R. NODLAND and G. A. POND (*Minnesota Sta. Bul. 378 (1944)*, pp. 24, several illus.).—The data were obtained from records of the Southeast Minnesota Farm Management Service for the years 1928-37, inclusive. An average of 146 records per year, total 1,462, were obtained each year in 10 counties. These are analyzed to show the effects on returns from dairy cows of size of herd, feed costs, production per cow, proportion of protein in the total digestible nutrients, ratio of concentrates to roughages, months on pasture, time of freshening, price of butterfat, and the factors causing variations in returns from other dairy cattle. The use of records to increase dairy returns is described.

As the farms excelled in zero to five of the following factors—pounds of butterfat per cow, total digestible nutrients per pound of butterfat, percentage of protein in the total digestible nutrients, proportion of digestible nutrients from concentrates, and percentage of cows freshening in the fall—the average return over feed per dairy cow increased from \$29 to \$59 per head and those for dairy cattle other than milk cows increased from —\$8.44 to \$19.43.

**Managing sheep for greater returns,** T. R. NODLAND and G. A. POND (*Minnesota Sta. Bul. 382 (1945)*, pp. 12, illus. 2).—Analysis is made of a yearly average of 146 farmers for the same period and from the same source as in the studies noted above, to show the relations to returns of size of enterprises, cost of feed, death losses, time of lambing, percentage lamb crop, prices received for lambs and wool, and time of sale of lambs. The average return per head of sheep over feed for farms excelling in zero to six of the following factors—gross returns per head, percentage lamb crop, value per lamb sold, prices received for wool, percentage death loss, and feed cost per head—increased from —0.31 ct. to \$5.22.

**Managing hogs for greater returns,** T. R. NODLAND and G. A. POND (*Minnesota Sta. Bul. 379 (1944)*, pp. 23, about 6 illus.).—Analysis is made of a total of 1,419 yearly records for the same period and source as those in the study above to show the variations in the factors of cost and returns—size of enterprises, feeding efficiency, sanitation and disease control, size of litters, fall litters, pigs saved, gilts v. older sows in breeding herds, and prices and weights of hogs sold. The value of records to increase returns is discussed.

The average returns per 100 lb. gain in weight over feed for farms excelling in zero to six of the following factors—pounds of feed needed to produce 100 lb. of hogs, percentage of protein in the ration, extent to which sanitation methods and practices were followed, percentage of death loss, number of pigs weaned per litter, and price received per 100 lb. of hogs—increased from —0.53 ct. to \$2.79.

**The broiler industry in Delaware,** H. A. JOHNSON (*Delaware Sta. Bul. 250 (1944)*, pp. 64, about 10 illus.).—Information is brought together on the history, development, and operation of the industry; prices; marketing, including feeding and fattening and dressing; research on production at the station; health regulations; and the organizations within the industry.

**An economic study of Washington's turkey industry in 1942—II, The production and sale of market birds,** C. N. BERRYMAN and M. T. BUCHANAN (*Washing-*

*ton Sta. Bul. 453 (1944), pp. 42, illus. 9).*—This is part 2 of the study (E. S. R., 92, p. 426). Analysis is made of variations in production costs and feed and labor requirements by areas, size of flock and mortality, size of flock and amount of green feed, type of ration, size of bird produced, and land use. The method of marketing, killing and dressing, time of marketing, channels of distribution, etc., and the outlook for the industry are discussed.

The average total costs were \$4.61 per bird and 25.2 ct. per pound, of which approximately 60 percent was for feed, 20 percent for labor, and 12 percent for pouls. The cost per pound was 27.2 ct. in Clark County, 24.5 in the Yakima Valley, and 23.7 ct. in Island County. More than 5,000 birds per farm were started in Clark County and less than 2,000 in the other two areas. Feed consumption per pound of gain differed very little whether the ration contained less than 40 percent, 40 to 59 percent, or 60 percent or more grain. Labor requirements per bird varied from 2.41 man-hours in flocks of less than 500 pouls started to 0.72 man-hour in flocks with more than 2,750 pouls started. It was estimated that the cost of production in 1944 would be about 26 percent higher than in 1942.

**Wartime changes in the financial structure of agriculture,** A. S. TOSLEBE, D. C. HORTON, R. J. BURROUGHS, H. C. LARSEN, L. A. JONES, and A. R. JOHNSON (*U. S. Dept. Agr., Misc. Pub. 558 (1945), pp. 32, illus. 7*).—A summary of the report *The Impact of the War on the Financial Structure of Agriculture* (E. S. R., 92, p. 570).

**Farm credit agencies serving the Cumberland Plateau, 1943,** B. H. LUEBKE, A. H. CHAMBERS, and C. E. ALLRED (*Tennessee Sta. Agr. Econ. and Rural Social Dept. Monog. 180 (1945), pp. 39+, illus. 23*).—The study deals chiefly with the 4 northern counties of the area, with some data on 21 others. It discusses the amount of loans made by commercial banks, individuals, and different Government agencies, the interest and other charges, and gives general information as to the commercial banks.

In the 4 counties in 1943, 8.5 percent of the real estate loans and 15.9 of the production credit were made by commercial banks, 8.9 and 10.4 percent by individuals, and the remainder by Federal agencies. On July 1, 1942 in the 21 counties, 27.5 percent of the real estate loans and 61.8 of the production credit loans were made by banks, and 8.9 and 10.4 percent by individuals. In 1943, 29 stores dealing with farmers sold \$396,774 worth of commodities on credit, being 31.4 percent of the total sales to farmers. Only 10.3 percent of the credit was for over 30 days.

**Recent trends of land tenure in North Dakota,** P. V. HEMPHILL. (Coop. U. S. D. A.). (*North Dakota Sta. Bim. Bul. 7 (1945), No. 3, pp. 11-17, illus. 1*).—Tables are included and discussed showing for a sample of three townships in each of five counties by years, 1941-44, the tenure of farm operators and percentage of land operated by each tenure class.

During the period the percentage of farms in the sample and average acreage operated by owners increased 8.1 percent and that by tenants decreased a like amount. The percentage of farms operated by tenants decreased 14.4 percent from 1941 to 1944.

**We could prevent land price inflation in Missouri,** O. R. JOHNSON (*Missouri Sta. Cir. 298 (1945), pp. 8, illus. 2*).—A popular circular discussing the present danger, evidences, and causes of farm land price inflation and the means by which such inflation may be reduced or prevented.

**Methods and problems of international statistics with special reference to food and agriculture: A list of references,** A. M. HANNAY (*Washington, D. C.: United Nations Interim Comm. on Food and Agr., 1944, rev., pp. 26*).

**Crops and Markets [January 1945]** (*U. S. Dept. Agr., Crops and Markets, 22 (1945), No. 1, pp. 68, illus. 3*).—Included are tables showing acreage, yield, and pro-

duction by States of different crops and fruits with comparisons with previous periods; summary tables of acreage losses, acreages of fruits, corn yields, harvested acreages of crops, production of seed crops, 1929-44, etc.; employment and wage rates of farm labor; and prices received by farmers, with tables summarizing by important crops the monthly prices. The usual crop, livestock, and marketing reports are also included, and a short article on the cost of producing field crops in 1943 with tables showing by States and regions the gross cost per acre, net cost per acre, per bushel, or per pound of corn grown for grain, wheat, oats, and cotton.

**Cost of living on farms and prices paid by farmers**, J. D. BLACK and A. MACDONALD (*Jour. Amer. Statis. Assoc.*, 39 (1944), No. 227, pp. 377-386).—Table shows for different years and periods, 1910—June 1944, the indexes of prices paid by farmers for production, family living, and the two combined; interest, taxes, and the last three added together. The suitability of the six series for use in determining changes in farm expenses or costs, real prices of farm products, real income of the farm population, parity price and income computations, and the effectiveness of the price control measures are discussed.

**Thirty-five years of farm prices to Idaho farmers**, A. N. NYBRO滕 (*Idaho Sta. Bul.* 260 (1945), pp. 19, illus. 1).—This bulletin supplements Bulletin 210 (E. S. R., 73, p. 866), as supplemented in 1941 by mimeographed Leaflet 34 (Index Numbers of Idaho Farm Prices), by furnishing certain averages and measures of fluctuations and recent prewar and wartime data.

**Factors that affect prices of feedstuffs in New York State**, K. R. BENNETT ([New York] Cornell Sta. Mem. 255 (1944), pp. 142, about 53 illus.).—Analysis is made of the long-time trends, factors affecting year-to-year movements, and the seasonal movements of the prices of corn, hominy feed, oats, wheat millfeeds, cottonseed meal, linseed meal, and corn gluten feed. Among other subjects discussed are: The relative importance of grains and other feedstuffs, interrelationships of prices of feedstuffs, effects of price level, United States supplies and quality of corn and oats, and Chicago prices of corn. The methods used in the study are described, and condensed summaries of the factors affecting year-to-year changes in November-April average prices at Utica, N. Y., 1910-39, are included.

**Consumption of fluid milk and cream in northeastern marketing areas, 1943**, L. F. HERRMANN, ET AL. (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1945, pp. 20+).—This report, prepared in cooperation with the War Food Administration and the statistics committee of the Northeastern Daily Conference, brings together and discusses data for 1943 with comparisons with previous years on the consumption of fluid milk, cream, and special types of milk by market areas.

**Farm production, disposition, and income, chickens and eggs, 1943-44**, E. S. KIMBALL, P. W. SMITH, and R. F. MOORE (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1945, pp. 15+).—Tables show by States for January 1, 1944 and 1945, the farm production of hens, pullets, and other chickens; the value, total and per head; the production, disposition, prices per pound, and cash and gross incomes; percentage of chickens sold, young and mature; average and total pounds sold in 1943 and 1944; rate of lay, prices per dozen, disposition, cash and gross incomes from eggs, 1943 and 1944; and the number, total weight, price per pound, and gross income of broilers, 1943 and 1944.

**Farm production, disposition, and income of turkeys, 1943-44**, E. S. KIMBALL, P. W. SMITH, and R. F. MOORE (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1945, pp. 9+).—Tables show by States the production, farm consumption, sales, prices per pound, gross income, etc.; average weight per bird; and percentage of total pounds sold by months.

**Commercial hatchery chick production**, E. S. KIMBALL, R. F. MOORE, and P. W. SMITH (*U. S. Dept. Agr., Statis. Bul.* 81 (1945), pp. 26+, several illus.).—

Included are tables and charts showing usually for 1938 and 1943 by States the number of hatcheries, capacity, rates of hatch and capacity of utilization, chick production, value of chicks, chicks sexed, etc.

**Wartime production of dry beans in selected areas of the Northern Plains,** R. B. HILE and N. O. THOMPSON. (*Coop. Nebr. and Colo. Expt. Sta. et al.*). (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 27+*).—Growing practices, costs, returns, etc., in 1943 are discussed as a guide to 1944 growers.

**Changes in hay production in war and peace,** N. W. JOHNSON (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, F. M. 47, pp. 37+*, illus. 7).—Tables show the acreages, yields, and production of different kinds of hay by years, 1920-44. The prewar and wartime changes and the peacetime implications of the wartime changes are discussed.

**Flaxseed production, farm disposition, and value, by States, 1909-41,** J. H. PETERS, A. P. KELLY, ET AL. (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1945, pp. 16+*).

**Acreage, yield, production, farm disposition, and value of popcorn, 1912-43,** by States, C. E. BURKHEAD, A. V. NORDQUIST, R. F. HALE, M. BAILEY, ET AL. (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1945, pp. 8+*, illus. 1).

**Prices received by growers for fruit and nut crops, by type of sale and utilization groups,** R. S. WOODRUFF (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, rev. and enl., pp. 64+*).—Tables show by years, covering different periods, the average monthly, seasonal, or annual prices and the returns from different types of sales and for different utilization of the more important fruits and nuts. Comparisons are made of parity and actual prices.

**Costs and returns of Florida citrus,** Z. SAVAGE (*Citrus Indus., 26 (1945), No. 2, pp. 8-9*).—The costs and returns per acre and per box found in a study by the Florida Agricultural Extension Service of 44 to 272 groves for the period 1931-32 to 1943-44, except the returns for 1943-44, are summarized in a table.

**The fundamentals governing canner-grower contracts,** W. A. HUELSEN. (*Ill. Expt. Sta.*). (*Canner, 100 (1945), No. 8, pp. 52-54, 78-86*).—The study is based on analyses of over 100 contracts submitted during 1941-43, inclusive, to the Illinois AAA Committee for certification. Part 1 discusses the fundamentals covering grower contracts in general, and part 2 the specific requirements of contracts for tomatoes, sweet corn, and peas.

**A survey of refrigerated warehouse space as of October 1, 1943** (*U. S. Dept. Agr., War Food Admin., Off. Distrib., 1944, pp. 28+*, illus. 10).—Tables and charts show the cold storage and refrigerated space in public, semiprivate, and private warehouses and meat-packing plants, total and by regions and States, and in important warehouse cities, and the expansion in space, 1923-43.

## RURAL SOCIOLOGY

**Part-time farming,** E. H. BELL and O. J. SCOVILLE (*U. S. Dept. Agr., Farmers' Bul. 1966 (1945), pp. 18+*, several illus.).—This is a guide for those who are looking for part-time farms, including young men now in military service, as well as county agents, teachers, and other local leaders.

**Climbing toward security,** R. R. SWIGER and O. F. LARSON (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 65+*).—The success of an experiment from 1938 to the end of 1942 in rehabilitating 606 families in 22 counties of 16 States is discussed and appraised. The methods used are described, and the work plan, the 1940 work calendar, and the cooperation and assistance request chart, 1940, for Beltrami County, Minn., are included.

Farm family income and patterns of living: An analysis of original census schedules and land classification of Henry County, Virginia, 1940, A. D. EDWARDS (*Richmond: Va. State Planning Bd.*, 1944, pp. 83, about 19 illus.).—This analysis was made in cooperation with the Virginia Experiment Station, the Virginia Polytechnic Institute, and the population study of the Virginia State Planning Board. The object was to determine the sources of income available to rural families, and it relates the income levels to a number of social and economic factors in a county in which industrial development is drawing heavily upon the rural section for labor. It "explores the possibility of using original census data, coordinated with other research data, for an intensive analysis of the factors influencing the levels of income and living among the rural families of a county." Using 1940 U. S. Census data and data and studies of the State Planning Board and previous studies of the station (E. S. R., 86, p. 699), analysis is made of the sources and amount of income, relations of acreages of crops, numbers of work stock, value of land, land class, production for home consumption, total production, off-farm work, composition of family, birth rate, mobility of population, housing, facilities and conveniences, quality of land, electrification, etc., and the patterns of living in different income groups. The methodology used is described.

For white and Negro families, respectively, the median incomes were: Total, \$878 and \$656; adjusted farm, \$278 and \$245; and off-farm earnings, \$903 and \$642. Of the white families 66 percent and of the Negro families 71 percent reported incomes from wages or salaries. Incomes increased with the proportion of time spent in off-farm work. Incomes and levels of living increased with quality of land. Level of income varied directly with schooling completed by the head of the family. Value of dwelling varied according to income. Overcrowding occurred in less than 20 percent of the white and about 40 percent of the Negro families. It varied little among income groups for whites but was more frequent in the higher income Negro families. If electric lines were extended, about twice as many families might be expected to avail themselves of electricity.

"No insuperable difficulties were encountered in matching agriculture, population, and housing census schedules for the same families. While present procedures for using census data for local studies are rather expensive, the results obtained more than justify the expense in many instances. The present study illustrates how widely scattered information gathered on separate schedules, if consolidated on one schedule would furnish quite inexpensively a variety of pertinent information of family income sources, levels of living, and other factors associated with them."

Changing patterns of employment in five Southeastern States, 1930-1940, J. B. GIRTNER and R. R. GIFFIN (*South. Econ. Jour.*, 11 (1944), No. 2, pp. 169-182).—Tables are included and discussed showing for Alabama, Georgia, North Carolina, Tennessee, and Virginia for the various categories the employment rates for persons of employable age, 1930 and 1940, and the percentages of change.

The employment rates per 1,000 for all industries for the States increased 23.6 in Virginia and decreased from 0.1 to 46.5 in the other States. For agriculture, forestry, and fishing, the decreases in the five States in total population ranged from 32.6 to 68.4; urban from 2.3 to 6.3; rural nonfarming from 16.0 to 30.4; rural farm from 37.2 to 92.6; white from 34.2 to 59.1; and Negro from 24.4 to 80.6.

Fertility rates and migration of Kentucky population, 1920 to 1940, as related to communication, income, and education, M. D. OYLER (*Kentucky Sta. Bul.* 469 (1944), pp. 43, illus. 13).—In Kentucky, during the decade 1930-40 covered by this study, the fertility rates for rural population exceeded the urban fertility rates, and the net migration was cityward. When the differences in population fertility and migration in Kentucky counties during this period were measured in relation to income, communication, and education, it was found that the higher the average farm

income, the lower the population fertility rate; and the higher the index of communication, the lower the population fertility rate. Income and communication are highly correlated. Public highway construction is shown to result in increased communication somewhat independently of average farm income. This is one way in which acts of public policy affect fertility rates independently of change in private income. Increase in high school attendance in Kentucky counties is the cause of a lower population fertility rate, even when variations due to change in income and communication are removed. This inverse relation between high school attendance and the fertility rate is due at first to fertility decline among the youngest women who delay marriage in order to complete high school training, then later among the older women into which these same women have matured. Net out-migration from the farm population reaches a maximum during ages 20-24. Low income is the strongest single influence in the stimulation of outward migration of Kentucky farm youth. Amount of education is the second strongest influence on migration. High fertility of population operates so closely in relation to low income that it seldom has a separate influence toward stimulating migration; rather, it operates through the stronger migration factor—low income—with which it is so directly associated.

**The territorial and occupational mobility of Washington youth**, P. H. LANDIS (*Washington Sta. Bul. 449 (1944)*, pp. 66+, illus. 28).—This study of 16,732 youth outlines the typical patterns of their territorial migration and the patterns of their interoccupational mobility. Data are also assembled dealing with the education of youth and their employment and earnings. The dominant pattern of territorial mobility in the State is migration from rural to urban areas. The larger the city, the greater is its drawing power over youth in the surrounding territories. Metropolitan areas are clearly consumers of population; they keep their own and add a large fraction of those produced in rural, small town, and, to a lesser extent, small city areas of the State. This general pattern of migration in the State leads one to infer that the rural school should give its youth some general understanding of the life and occupations of larger communities.

**Washington high school graduates in the second war year**, P. H. LANDIS (*Washington Sta. Bul. 454 (1944)*, pp. 16).—During the 8 yr. prior to the war, an average of 36.7 percent of the boys went on to school after high school graduation, the majority of these to institutions of higher learning. The situation was not changed to any great extent during the first year of the war; 34.3 percent still went on to school, but by the second year of the war, when the effect of Selective Service in taking 18- and 19-year-olds was felt, only 9.4 percent went on to school. Work attracted a much higher proportion of rural girls during 1943 than during prior periods. During the period of low employment of the prewar years, only 6.5 percent of rural girls found a place in store and office work after high school graduation; in 1942, 22.1 percent; in 1943, 25 percent. Factory work and trades also drew a much higher proportion of rural girls during the war years; 2.4 percent in the prewar period, 7.7 percent during the first war year, and 12.7 percent during the second war year. During the second year of the war about the same proportion of young men from rural areas chose farming as a vocation as during the average of the 8 yr. prior to the war, but a much higher proportion than during 1942. This undoubtedly reflected Selective Service policy which gave agriculture a high priority on manpower during the second year of the war.

**The growth and redistribution of population in Brazil**, T. L. SMITH. (La. State Univ.). (*La. Acad. Sci. Proc., 8 (1944)*, pp. 103-114, illus. 1).—Natural increase of population, immigration, and a strong southward current of internal migration have combined to make the population of the Southern States increase at a rate far exceeding that in other portions of Brazil. In the great northeastern

section population increase has not kept pace with the national average, and throughout much of the great Amazon Valley there has been an actual decrease in population during the last 20 yr.

**Neighborhood-community relationships in rural society**, J. H. KOLB and D. G. MARSHALL (*Wisconsin Sta. Res. Bul.* 154 (1944), pp. 55+, several illus.).—This is an evaluation of neighborhoods and communities in Dane County, Wis. Both neighborhood and community groups in the county have been studied over a period of 23 yr. by systematic field surveys at 10-yr. intervals, 1921, 1931, 1941, by numerous intensive studies of sample cases, and by personal contacts and observation throughout the time. The important findings are briefly reported, together with some of their implications. Sections on methodology, meanings of terms used, a selected bibliography, and supplementary tables are included as an appendix.

**Cooperative communities at work**, H. F. INFELD (*New York: Dryden Press, 1945, pp. 201*).—This book, based on a survey sponsored jointly by The Research Institute on Peace and Postwar Problems, The American Jewish Committee, and The Rural Settlement Institute, describes the most significant instances of cooperative living in relation to postwar planning and their application to resettlement today. It considers "(1) the motives back of each community, with a short history of its origin; (2) the human element, membership requirements, duties and rights of members, their racial, social, and political backgrounds; (3) administration and management; (4) the degree of cooperation practiced; (5) finances, credits, expenses, and profits; (6) the approximate turnover in each community; and, finally, (7) an evaluation of advantages and drawbacks in relation to postwar resettlement." A bibliography is included.

**Local government debt in rural counties of Ohio**, A. S. TOSTLEBE (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 46+*, illus. 12).—The trends 1910-42 in outstanding county, school district, and township indebtedness are shown, and the purposes of the borrowing, the reasons for changes, sources, cost, and maturity of loans, and the future of the indebtedness for different units are discussed.

**Location and movement of physicians, 1923 and 1938: Changes in urban and rural totals for established physicians**, J. W. MOUNTIN, E. H. PENNELL, and G. S. BROCKETT (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 7, pp. 173-185, several illus.).—The combined effect of physician migration, recruitment, and losses from the profession, over the period 1923-38, resulted in gains for both large and small cities and in losses for rural communities. Comparison of physician totals with population data indicates that the tendency for physicians to concentrate in large urban areas somewhat parallels, but exceeds in magnitude, the trend for the population as a whole. Failure of rural localities to attract and retain a proportionate share of new registrants has resulted in a distribution heavily weighted with old physicians. In 1923 the median age of rural physicians was 4 yr. above that for those in large cities, and by 1938 this difference had extended to 10 yr.

**A handbook on health for farm families** (*U. S. Dept. Agr., Farm Security Admin. Pub. 129 (1944)*, pp. 16, several illus.).—This publication gives practical advice concerning how to keep well notwithstanding the scarcity of doctors and hospitals in the rural districts.

**Where do Utah's rural offenders live: Farmers living on periphery of village found to have highest offense rate**, J. N. SYMONS (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 1, p. 14).—"All violators on any record" for the period 1932-37 in six counties were grouped into four residence groups. The numbers of all offenders, male and female, per 1,000 population (1935) in the four groups were: Edge-of-village farmers, 151.7 and 29.0; nonfarmers, 79.2 and 18.1; farm-dwellers, 46.0 and 11.7; and village-farmers, 40.9 and 9.9.

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

**History of the Missouri College of Agriculture, F. B. Mumford** (*Missouri Sta. Bul. 483 (1944)*, pp. 300+, illus. 23).—This comprehensive and authoritative history covers the period ended with the close of Dean Mumford's administration in 1938. Part 1 (pp. 5-44) deals with the early history of the college; part 2 (pp. 45-150) with the administrations of deans and presidents; part 3 (pp. 151-222) with building the college of agriculture, including the experiment station; and part 4 (pp. 223-300) with a history of the departments of the college, supplied by the respective chairmen, and a concluding word entitled A Brighter Day for Agriculture.

**Conference workbook on problems of post-war higher education** ([U. S.] *Fed. Security Agency, Off. Ed. [1944]*, pp. 38+).—The four parts deal with suggestions for planning postwar conferences, topics with illustrative questions, bibliography, and the devices and plans reported by institutions.

## FOODS—HUMAN NUTRITION

**Composition of vegetables grown in the South** (*Georgia Sta. Rpt. 1944*, pp. 77-79).—This is a preliminary report of several investigations. Shogoin turnip greens were found to have higher ascorbic acid content than Seven Top, Purple Top, and Pomeranian White Globe varieties. Neither the level of nitrogen in the soil nor stage of maturity had a significant influence on the ascorbic acid content of the greens. There was little loss of this vitamin in greens stored for 24 or 48 hr. under refrigeration, but storage at room temperature caused large losses.

Henderson Bush and Carolina Sieva lima beans were used in other studies. Shelled beans showed a greater loss of ascorbic acid during storage than did unshelled beans, and storage losses even in unshelled beans were much greater at room temperature than under refrigeration. Freshly harvested beans lost a negligible amount of ascorbic acid when cooked for an hour and about 23 percent when cooked for 3 hr.; beans held in storage before cooking showed greater cooking losses than unstored beans.

Three varieties of tomatoes—Marglobe, Rutgers, and Gulf State Market—were harvested at three stages of ripeness. There was no marked difference in the ascorbic acid content of the three varieties. The pink-ripe fruit contained 20 percent less ascorbic acid than the green or vine-ripened fruit. The tomatoes picked at the green or pink stage and stored until ripe contained less ascorbic acid than vine-ripened fruit. The vitamin in the green tomatoes was very rapidly destroyed when the tissues were macerated, but slicing of the ripe tomatoes followed by storage in the refrigerator for 5 hr. caused no loss of ascorbic acid. Ripe tomatoes stewed for 2 hr. lost 20 percent of their original ascorbic acid, whereas those stewed for 10 min. showed no change.

Carotene in sweetpotatoes was found not to increase during the curing but to increase gradually during storage, while ascorbic acid content decreased about 20 percent during curing, and still more during storage. Single roots showed very wide variations in carotene and ascorbic acid content. The stem end was highest in moisture and carotene content and the middle section highest in ascorbic acid.

Pimientos of the Truhart Perfection variety harvested at 3-week intervals from August 10 to November 9 showed similar carotene values for fully ripe fruits of the first two harvests. At the third harvest, however, the carotene had increased about 300 percent, and remained at this high level throughout the rest of the season. The ascorbic acid content was approximately the same for the first three harvests and about 40 percent greater at the fourth and fifth harvests. In commercial canning trials the Truhart Perfection variety was found to retain more ascorbic

acid than the Perfection pimiento. No significant change in the ascorbic acid content occurred during roasting, but a loss of 47 percent resulted from the prolonged washing and soaking to which the fruit were subjected after roasting. No changes in this vitamin occurred in the latter stages of processing, steam blanching, and pressure cooking. No change in carotene content occurred during the entire process.

The use of peanuts and peanut products (*Georgia Sta. Rpt. 1944*, pp. 67-73, illus. 1).—Of the several methods tested for canning peanuts, in an effort to extend the storage period, the one that gave an acceptable product involved germination of the peanuts and canning unblanched under 10 lb. steam for 60 min. Peanuts thus canned were crisp, firm, and of good flavor, although there was some astringency. Oiliness was hardly noticeable, but there was a tendency for suspended starches and proteins to settle to the bottom of the jars upon cooling; the use of a tomato sauce over the sprouted peanuts masked the coagulated sediment.

Commercially prepared peanuts and peanut products stored under different conditions of temperature, humidity, and light were good after 1 mo. at room temperature and 50 percent relative humidity, stale at 65 percent r. h., and rancid at 80 percent r. h.; under the latter condition they were objectionably moist and beginning to stale even after 2 weeks. There were no noticeable differences between samples of peanut candy and peanuts stored in light and dark, but a few samples of peanut butter stored in the light were slightly stale.

Peanuts half roasted, blanched (with skins removed), and ground to a paste or butter were successfully used as a substitute for shortening in a wide variety of bakery products. For bread, gingerbread, biscuits, corn bread, hot cakes, waffles, and muffins the paste was needed in an amount  $2\frac{1}{3}$  times that of the shortening called for in ordinary recipes; in pastry  $2\frac{1}{2}$  times as much was needed. This meant an increase in the total fat content of bread by about 12 percent of the amount needed, because some of the fat in the peanut particles was not available for shortening. There was also an increase in the total protein content of the breads, which tended to make them heavier. Pastry and biscuits containing the peanut paste were slightly less flaky than when made with ordinary fat, while rolls, bread, and gingerbread were of smooth texture, with air cells uniformly distributed and small in size.

Ground peanuts were found satisfactory for seasoning vegetables in cooking, 3 oz. of ground, blanched (with skins removed) peanuts per pound of vegetable as cooked being a satisfactory proportion. For white vegetables such as potatoes, lima beans, and fresh or dried field peas [cowpeas] the ground peanuts placed in a small muslin bag were cooked directly with the vegetable. For green or yellow vegetables the ground peanuts were cooked separately and the cooled liquor freed of the fat layer was added to the cooked vegetable in order to obviate the whitish appearance which the dispersed oil would give to the colored vegetables. It was found impractical to use the ground peanuts dispersed throughout the boiling liquid, as they caused excessive foaming and became so thoroughly mixed with the vegetables that separation was impossible.

Food uses for soybeans, D. S. PAYNE and L. S. STUART (*Soybean Digest*, 5 (1944), No. 2, pp. 10-13, illus. 1).—This paper was presented before the wartime public health conference of the American Public Health Association, in New York City, October 1944.

Native foodstuffs in Tanganyika, C. G. GLEGG (*Trop. Agr. [Trinidad]*, 22 (1945), No. 2, pp. 32-38).—Many commonly used foods, some cultivated, some wild, are listed with brief descriptive notes concerning the nature of the plant, or the part eaten, and its use. Common methods of preparation and cooking are briefly described for the staple foods, particularly sorghum, maize, and millet, and to a lesser extent cassava and sweetpotato; the various leafy vegetables; seeds,

including cowpeas, the black gram, sesame, peanuts, and the Bambara groundnut; mushrooms; and fruits, including bananas, mangos, tomatoes, [papayas], watermelons, and the flesh from the seed pods of baobab and tamarind trees. Methods of preparing certain of the foods for storage are also noted, and protein foods and condiments are considered briefly. The four methods used for making the native beer from sorghum are described. In the appendix are noted botanical and native Kisukuma names for all of the plants, English names for some of them, and indication of the season when available and the relative palatability.

**Ration biscuits.**—Factors affecting the keeping quality of biscuits containing protein supplements, J. A. PEARCE and J. B. MARSHALL (*Canad. Jour. Res.*, 23 (1945), No. 1, Sect. F, pp. 22-38, illus. 2).—"The storage life of biscuits was extended by maintaining a moisture content of 6 percent or less. From considerations of initial quality and of increased storage life, sodium bicarbonate was superior to ammonium bicarbonate as a leaving agent, particularly at lower levels. By the same criteria, wheat germ appeared to be a more satisfactory source of protein than soya flour, dried skim milk, or dried egg yolk. Moisture-resistant packaging materials were found necessary to prevent mold growth and maintain edibility in biscuits stored at high humidities; however, biscuits so packed deteriorated at a faster rate at high temperatures. Tin-plate containers appeared to be the most effective for long-term storage at high humidities, although Reynolds' metal A-10 with or without an inner liner was satisfactory for storage periods of about half a year. While none of the quality measurements used were completely reliable measures of biscuit quality, a fluorescence measurement assessed the effects of the various treatments in a relatively satisfactory manner."

Some factors involved in the staling of whole wheat bread, N. C. ESELBAUGH (*Ohio State Univ., Abs. Doctoral Diss.*, No. 44 (1944), pp. 165-171).—This investigation centered attention on the possible role that the proteins of bread might play in the staling process and followed therefore the changes in the solubility of the nitrogen compounds of the bread crumb over an experimental period of 72 hr. A hard whole wheat bread made by the 50-percent sponge and dough method of mixing was used, and each bake included a control mix, another mix treated with potassium bromate, and two other mixes to which 0.4 and 0.8 percent bentonite were added, respectively. The chemical changes observed indicated that aging was accompanied by: "(1) An increase in the nitrogen-containing compounds and the amino acids of the water extract after an initial decrease; (2) after an initial reduction there was an increase in the pH value of the crumb; (3) at the same time the free titratable acids of the water extract increased in value; (4) the total solids of the water extract progressively increased; (5) the whole wheat breads treated with bentonite gave values in the above measurements which are noticeably less than for the control and bromated breads—bentonite may aid in retarding these changes which occurred with aging of the whole wheat bread; and (6) the swelling capacity test for staling is of questionable value for whole wheat bread older than 24 hr."

**Home canning of meat** (*U. S. Dept. Agr.*, 1945, AWI-110, pp. 16, illus. about 50).—Step-by-step directions, clearly illustrated pictorially, are given for the canning of poultry, pork, and other meat. Canning timetables for pint and quart jars, and No. 2, 2½, and 3 cans are given for each product. It is stressed that for safe canning of meat a pressure cooker must be used.

**Factors affecting the storage of dehydrated pork**, J. A. PEARCE (*Canad. Jour. Res.*, 23 (1945), No. 1, Sect. F, pp. 9-21, illus. 4).—Materials prepared in a previous investigation of dehydrating methods (E. S. R., 91, p. 481) were utilized in the present study of the keeping quality of dehydrated pork as affected by methods of preparation, storage temperature, moisture content, and types of packages. In

an accelerated storage test at 60° C., samples containing 20-30 percent of fat showed satisfactory keeping quality as evidenced by palatability scores and peroxide-oxygen values. Samples of tunnel-tray-dried uncured pork (some containing 6.6 moisture and others 14 percent), stored at temperatures from -17.8° to 36.7°, were rated for palatability after 1 yr. of storage and were tested for peroxide values at intervals throughout the storage period. Peroxide values of both lots of the dehydrated pork decreased to 0 after 1 mo., but rose to a maximum at about 8 mo. storage and then decreased to the end of the period. The maximum for the high-moisture samples was about seven times as great as that for the low-moisture samples. On the basis of palatability measurements, the samples receiving the lowest scores were those stored at 15.6° and 36.7°. No explanation was found for the low palatability scores at 15.6°. Dehydrated pork stored in tin-plate containers for periods of 1 yr. at 23.9° and 36.7° decreased but little in palatability. No differences in storage life were demonstrated between cured and uncured pork, nor did differences in drying times or moisture content effect any differences in storage life. The product prepared on an atmospheric double-drum drier deteriorated a little more rapidly than vacuum-tray- or tunnel-tray-dried material. The relative effectiveness as container materials of tin plate, Reynolds' metal A-10, Dewey and Almy P-16, and 300 M. S. T. cellophane, decreased in that order.

**Sulfite solutions in potato dehydration**, C. J. TRESSLER, JR. (*Food Packer*, 25 (1944), No. 13, pp. 33-34).—Sulfiting experiments carried out both on a small scale and a commercial scale showed that control of darkening of surfaces of whole potatoes was effected by dipping the freshly peeled tubers in 1-2 percent sulfite solution; still better control was afforded if this was followed by a second dip at the time of trimming. Dipping of the blanched, diced potatoes gave further control of darkening, lessened the tendency to scorch, increased storage life, and permitted better ascorbic acid retention. The retention of thiamine was decreased, however, by the sulfite treatment.

**The effect of preparation of food on its nutritive value**, L. W. HUNT, D. OSBORNE, and H. FORT (*Washington Sta. Pop. Bul.* 177 (1944), pp. 19).—The various factors influencing the composition of food are enumerated briefly, and the effect of cooking, including precooking preparation, is considered in more detail with respect to the effect on vitamin, mineral, and energy values of the food. The effect of the preparation of food on its digestion and utilization is also considered briefly.

**New developments in nutrition research**, J. O. HOLMES. (Mass. State Col.). (*Milk Plant Mo.*, 34 (1945), No. 2, pp. 22-24, 57-63).—This paper was presented at the [1944] summer conference of the National Dairy Council.

**New steps in public health** (*Milbank Mem. Fund Ann. Conf. Proc.*, 22 (1944), pp. 148+, illus. 26).—This volume is the second of the two prepared for presenting the proceedings of the twenty-second annual conference of the Milbank Memorial Fund, April 12-13, 1944. The first volume deals with population problems, while the second is concerned with new approaches to public health problems. The following papers are presented: Findings of the Study of Chronic Disease in the Eastern Health District of Baltimore, by J. Downes (pp. 1-15); The Peckham Experiment, by G. Baehr (pp. 16-21); Findings of Selective Service Examinations, by G. S. Perrott (pp. 22-30); Recent Findings on Nutritional Status of Industrial Workers, by D. G. Wiehl (pp. 31-46); Provision of Better Medical Care, by J. A. Curran (pp. 47-59); Proper Attention to the Role of Emotional and Social Factors in Illness as a New Step in Public Health, by G. C. Robinson (pp. 60-67); More Adequate Provision and Better Integration of Community Facilities, by B. B. Burritt (pp. 68-78); The Role of Nutrition in Preventive Medicine, by F. F. Tisdall (pp. 79-93); Nutrition—Its Place in Our Prenatal Care Programs, by

B. S. Burke (pp. 94-105); The Importance of Prenatal Diet, by J. Warkany (pp. 106-117); Protecting the Health of the Industrial Worker—Nutrition, by R. S. Goodhart (pp. 118-128); The Effects of Hard Physical Work Upon Nutritional Requirements, by W. H. Forbes (pp. 129-136); and The Improvement in Nutrition as Protection Against Industrial Toxicity, by W. E. Crutchfield, Jr. (pp. 137-148).

**Spontaneous activity in relation to diet in the albino rat**, E. A. SMITH and R. M. CONGER. (Iowa State Col.). (*Amer. Jour. Physiol.*, 142 (1944), No. 5, pp. 663-665, illus. 3).—Three groups of rats were observed over 3-mo. periods for spontaneous activity of the animals confined in individual rotary cages. The cages were so constructed that a large proportion of the energy expended by the rat was utilized in running the cage, which was equipped with a rotary ratchet counter. The basal ration, so constituted as to allow maximum growth and reproduction throughout the life span of the rat, was modified for two groups of nine animals each by substitution with enough fat to furnish about 41 and 72 percent of the calories, respectively; and, for the third group of nine animals, by substitution with enough protein to furnish 50 percent of the calories. Activity records of these three groups, in comparison in each case with records of carefully paired groups of nine animals each fed the basal ration, indicated: "(1) That as much as 56 percent of the calorific value of the food may come from fat and spontaneous activity be maintained at a normal level; (2) that 72 percent of fat calories depresses activity a little; and (3) that 50 percent animal protein induces a marked decrease in activity."

**Scientific basis for the recommended dietary allowances**, L. J. ROBERTS (*N. Y. State Jour. Med.*, 44 (1944), No. 1, pp. 59-65).—In this paper, read at the annual meeting of the Medical Society of the State of New York on May 4, 1943, the author, chairman of the committee on dietary allowances of the Food and Nutrition Board of the National Research Council, describes the procedure followed by the committee in deriving the table of recommended daily allowances for specific nutrients, now customarily used as the standard for comparison in diet evaluations, and reviews the evidence on which the values were based.

**The recommended dietary allowances**, L. J. ROBERTS (*Food and Nutr. News*, 16 (1944), No. 3, pp. 1, 4).—The usefulness and validity of the National Research Council standard allowances as noted above are discussed on the basis of practical usage over a period of 3 yr., with the conclusion that "the dietary allowances have served a useful purpose, and may continue to be used as guides in planning diets for families or groups, and also for postwar planning for food production. They will be revised from time to time as newer evidence indicates more clearly what the requirements are for the various constituents. In the meantime, they should be used as recommended allowances rather than as absolute requirements."

**Etudes sur l'économie dirigée.—II, La consommation dirigée en France en matière d'alimentation [Studies on controlled economy.—II, Controlled consumption of foodstuffs in France]**, P. and L. BAUDIN (Paris: *Librairie Gen. de Droit et de Jurisprudence*, 1942, pp. 118+).—This book, dealing with problems of wartime food control, discusses (1) basic facts of nutritional hygiene, including nutritional requirements, minimum diet schemes, and average food consumption in 1939 and 1940, (2) ration cards, and (3) dietary supplementation of the ration from the theoretical and practical viewpoints, the latter involving consideration of the principal nonrationed foods, suggestions for the choice of supplementary foods, and some examples and observations.

**Everyday nutrition for school children**, E. N. TODHUNTER (University: *Univ. Ala.*, 1945, pp. 57, several illus.).—This booklet has been prepared to offer suggestions to the classroom teacher, particularly in the South, for planning a school

program to include nutrition teaching. In the opinion of the author, "the teaching of nutrition is not the responsibility of any one teacher but of all the teachers. It should be an all-school program. Because the kind of food eaten so vitally affects growth and development, both physical and mental, it is important to start this work in the lowest grades. It is easier to form good food habits in the young child than to try to change poor food habits after they are established. It is wiser to build a sound body than to try later in life to repair one that has been injured by malnutrition."

The foundation material is presented in brief sections dealing with such items as nutrition objectives in teaching, planning the nutrition program, judging good nutrition, what is an adequate breakfast—an adequate lunch, and the basic seven food groups of the U. S. D. A. War Food Administration. As a further aid to the teacher, some of the nutrition questions most frequently asked are answered and a few of the most recent studies on the effect of diet on health, morale and disposition, fatigue, and learning ability are summarized briefly. Various teaching devices are suggested for making nutrition information a part of the work of all classes and subject-matter groups and for evaluating the nutrition program. A selected list of references on foods, nutrition, and school lunches and on teaching suggestions and units is appended.

**How to feed children in nursery schools,** M. E. SWEENEY and M. E. BRECKENRIDGE (*Detroit 2: Merrill-Palmer School, 1944, pp. 46+, illus. 8*).—This booklet, based on the experience of the Merrill-Palmer School, presents the general plan for the out-of-the-home meals for the preschool child, discusses the nutritional requirements of such a child, and gives general advice on the practical aspects of planning, buying, and preparation involved in the serving of the school lunch. Recipes (for 50 servings) used at the school are given for a variety of prepared dishes.

**Food service in institutions,** B. B. WEST and L. WOOD (*New York: John Wiley & Sons; London: Chapman & Hall, 1945, 2. ed., pp. 599+, illus. 56*).—The present edition (E. S. R., 80, p. 132) has been expanded to "present more adequately the subjects of meat extenders (protein-rich foods), frozen foods, and dehydrated foods. Under Organization and Administration of Food Services, greater emphasis has been given to personnel and labor problems and to the legal aspects of food services. Section III, Equipment for Food Services, has been enlarged to include some consideration of the industrial food service. A shift has been made in the sequence of subject matter, and material previously presented in the appendix has been incorporated in the text, thus unifying the discussion of various topics. A suggested list of problems is offered in the appendix for each of the following courses: Quantity Food Preparation, Organization and Management of Institutional Food Services, and Equipment and Furnishings."

**Army food and messing: The complete manual of mess management** (*Harrisburg, Pa.: Military Scr. Pub Co., 1944, 4. ed., pp. 435+, illus. about 115*).—This book, formerly titled Manual of Mess Management, is offered with the intention of meeting the needs of every man in the organization. It is not an official publication, but represents the results of efforts of one mess officer to compile material from various official manuals into one conveniently available volume. The subjects covered include mess management; kitchen management; principles and practice of cooking; cooking dehydrated foods; baking; the cutting and storage of meat and the cooking of meats, fish, and poultry; inspection and storage of subsistence supplies; recipes; descriptive facts concerning a large variety of foods; and mess sanitation. The appendix includes an issuing table of provisions per man per meal, tables giving weights and measures and other useful information, a minimum standard 10-day menu, and instructions on the preparation of various fried foods.

A nomogram for percentage increase of body weight over ideal weight, A. B. ANDERSON (*Brit. Med. Jour.*, No. 4386 (1945), p. 120, illus. 1).—The nomogram presented has been developed from Newburgh's table of ideal weights for height. Weights from 100 to 350 lb. are marked in intervals of 10 lb. on a vertical line and heights (for men and women separately) up to 6 ft. in intervals of 1 ft. on another vertical line, while on a slanting line are marked in intervals of 10 the percentages of overweight. "To use the nomogram, the height and weight are measured and a straight line joining the points on the height and weight scales is produced to cut the percentage scale. The point of intersection gives the percentage over ideal weight. If the zero point on the percentage scale is joined to the appropriate point on the height scale, the intersection on the weight scale gives the ideal weight."

Physical growth from birth to two years.—I, Stature: A review and synthesis of North American research for the period 1850-1941, H. V. MEREDITH (*Iowa Univ. Studies Child Welfare*, 19 (1943), pp. 255+).—As noted in the introduction, "the central objective of the present monograph is to afford a comprehensive review and synthesis of one readily delimitable segment of the research literature on physical growth during infancy. Concisely, the segment treated encompasses the problems, procedures, and findings from investigations on infant stature made in North America prior to 1942. The presentation is bipartite. Part I supplies a synthesis of the information that has accrued from North American research on 'stature in infancy' during the period 1850 through 1941. Part II presents an annotated bibliography on infant stature which draws upon 130 different studies executed in North America prior to 1942." In part I, the material presented is organized in sections dealing with average stature; secular differences; racial differences; geographic differences; socioeconomic differences; differences with parity, age, and stature of mother; sex differences; differences among seriatim records for individual infants; stature of infants born prematurely; relationships between stature and disease; and stature in relation to diet. The bibliography, with extensive annotations including some tabulations, is arranged alphabetically by authors. An appendix contains 23 tables assembled from the reports noted in the bibliography "displaying central tendency and variability values for stature at nine infancy ages."

Associative dynamic effects of protein, carbohydrate, and fat, E. B. FORBES and R. W. SWIFT. (*Pa. Expt. Sta.*) (*Jour. Nutr.*, 27 (1944), No. 6, pp. 453-468, illus. 2).—In this investigation of the dynamic effects in mature male albino rats of protein (dried and extracted beef muscle), carbohydrate (cerelose), and fat (commercial lard), fed singly and in four combinations as supplements to the same quantity of the same nutritionally complete basal maintenance diet (a commercial dog food), 12 rats of the same age and approximately the same body weight at the beginning of the experiment were used in each unit of the study, in which essentially the same technics were used as in earlier studies of the dynamic effects of the same nutrients fed separately (E. S. R., 82, p. 229). The dynamic effects of the supplements were computed as the differences between the quantity of heat produced on the basal and on the supplemental diet.

The feeding of beef protein, cerelose, and lard individually as supplements to the complete basal diet increased the production of heat from the kind of nutrient fed. Cerelose spared protein and fat, the latter twice as much as the former; beef protein spared carbohydrate and fat about equally; lard spared protein very effectively but had no effect on carbohydrate. Of the mixed supplements, cerelose and beef protein increased heat production from carbohydrate and protein, cerelose and lard from carbohydrate, beef protein and lard from protein, and all three from protein and carbohydrate. All mixed supplements spared fat.

The dynamic effects of mixed supplements of protein and fat and of carbohydrate and fat were lower even than the dynamic effect of fat alone. Among the four supplementary combinations of the three types of nutrients computed to 1,000 calories of gross energy, the one with the lowest dynamic effect was the combination of protein and fat and the highest that of protein and carbohydrate. The observed dynamic effect of the protein and fat combination was 54 percent less, and of the protein and carbohydrate 12.5 percent less, than as computed from experimentally determined values for the individual nutrients.

"While there is a question as to the applicability of results obtained with one species of animal to the nutrition of another species, the results of this study suggest, at face value, that it is not necessary to diminish the protein content of the hot-weather human diet in order to have a low heat increment, since this purpose can be accomplished by the equicaloric substitution of fat for carbohydrate."

**Experiments on the practicability of increasing calcium absorption with protein derivatives.** T. C. HALL and H. LEHMANN (*Biochem. Jour.*, 38 (1944), No. 1, pp. 117-119, illus. 1).—Work of McCance, Widdowson, and Lehmann having shown that the calcium absorption of man could be considerably improved by increasing the total protein intake from about 60 to 160 gm., the present work was undertaken to obtain more data on this protein effect. The calcium salt (in this case,  $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$ ) was administered with peptone powder as a cheap source of amino acids. The preparation, containing 100 mg. of the calcium salt, 2,000 mg. peptone, 200 mg. glutamic acid (to improve the taste), 550 mg. lactose, and 150 mg. gum acacia, was administered to human subjects at the rate of four powders three times daily, giving a daily calcium intake of 279 mg. In 14 of the 18 subjects, urinary calcium excretion, followed as an indirect measure of absorption and determined during 5 hr. after 750 cc. distilled water had been drunk, was higher after intake of the peptone powders than after intake of the control powders containing the same amount of calcium and only lactose and gum acacia in addition. Except in one hypocalcemic patient, the peptone powders produced no rise in serum calcium in the several subjects tested. It is concluded that the calcium peptone powder devised would be suitable for increasing the calcium absorption in man.

**Effect of cadmium and fluorine on the rat dentition.** J. T. GINN and J. F. VOLKER (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 2, pp. 189-191).—Groups of rats on diets containing, respectively, 50 p. p. m. cadmium in the food, 50 p. p. m. cadmium in the water, and 50 p. p. m. fluorine in the water were observed over a 150-day experimental period, at the end of which they were sacrificed and the dentition examined microscopically for evidences of dental caries. The cadmium, like the fluorine, caused a loss of incisor enamel pigmentation and a drop in the blood hemoglobin. It is suggested that these changes are related to the ability of the elements to interact with iron-containing proteins. The enamel pigmentary changes associated with the cadmium diet were characterized by an over-all bleaching devoid of striations, whereas the fluorine caused alternate pigmented and non-pigmented striations. The cadmium diets, unlike the fluorine diet, failed to reduce caries development beyond that observed in the control group receiving neither cadmium nor fluorine.

**Fused phosphates of varying fluorine content as a phosphorus supplement to rats** (*Tennessee Sta. Cir. Inform.* 70 (1944), pp. 8).—This circular is issued as a progress note on basic laboratory studies, employing growing white rats as test animals, to determine the value of fused phosphate low in fluorine content as a source of phosphorus in animal feeding. This phase of the work was conducted cooperatively with the Tennessee Valley Authority as part of a project on the role of phosphorus in the soil-plant-animal relationship. The feeding tests utilized a basic ration containing 4 percent Osborne and Mendel salt mixture. For the test diets,

calcium and phosphorus were omitted from the salt mixture and were furnished instead by dicalcium phosphate or by fused phosphates containing 0.04, 0.2, 0.3, or 0.55 percent fluorine. No difference in growth or in phosphorus content of the rat at the end of 30 days was noted between control rats and those receiving the fused phosphate containing 0.04 percent fluorine. Rats receiving the fused phosphate containing 0.2 percent fluorine for 60 and 90 days showed no significant differences either in growth or phosphorus retention when compared with the controls; with the fused phosphate containing 0.3 percent fluorine, growth was again comparable with that of control animals. Rats fed the 0.55-percent fluorine fused phosphate showed slight but significant differences, both in growth and phosphorus content, as compared to controls for the 30-day experimental period. Rats fed the dicalcium phosphate for 30 days showed no difference in growth but a significantly lower phosphorus content, as compared with the controls, but no difference either in growth or phosphorus content as compared with animals fed fused phosphate. When sodium fluoride was added to the control diet to furnish fluorine at the levels occurring in the diets supplemented with fused phosphates, the rats compared favorably with the controls, both in regard to growth and phosphorus retention. Examination of the teeth showed either a very slight or no effect of fluorine in rats on the control diet (11 p. p. m. fluorine); definite effects, but not necessarily harmful ones, were observed in animals fed fused phosphate (15-67 p. p. m. fluorine in the diet), and very definite but not necessarily harmful effects were observed for those receiving the sodium fluoride.

**Fused phosphates of varying fluorine content as a phosphorus supplement to rats.** D. E. WILLIAMS, F. L. MACLEOD, and E. MORRELL (*Tennessee Sta. Cir. Inform.* 70 (1944), Sup. 1, pp. 5).—In continuation of the above study, rats fed fused phosphate supplements containing 0.2 and 0.3 percent fluorine were observed for reproductive performance in comparison with rats fed a control stock laboratory diet. In order to distinguish between the effects of fluorine toxicity and phosphorus deficiency, the comparisons were made at two different phosphorus levels, one, approximately 0.2 percent of the total diet, being just about minimal for normal growth to maturity, and the second, approximately 0.4 percent of the total diet, designed as adequate for growth and for reproduction and lactation. "At this stage of the experiment, the animals at the adequate phosphorus level that are deriving their phosphorus from fused phosphate containing either 0.2 percent or 0.3 percent fluorine are giving about as good as or better reproductive performance than those deriving phosphorus from Osborne and Mendel salt mixture. For the 0.2-percent fluorine fused phosphate diet there have been, so far, not quite so many born and raised as on the control diet, but for the 0.3 percent fluorine fused phosphate diet, there have been more young born and raised than for the controls. These tests are still in the early stages, and all that can be said is that up to this point the animals fed the fused phosphates containing either 0.2 percent or 0.3 percent fluorine at an adequate total phosphorus level have shown very satisfactory breeding results as compared to animals fed a normal control diet." Reproductive performance of animals at the low phosphorus level was less satisfactory than at the adequate phosphorus level, both in the control and the fused phosphate groups.

**Congenital malformations induced in rats by maternal nutritional deficiency.—VI, The preventive factor.** J. WARKANY and E. SCHRAFFENBERGER (*Jour. Nutr.*, 27 (1944), No. 6, pp. 477-484).—A brief review is first given of the earlier papers in the series, in which congenital malformations occurring in the offspring of female rats reared and bred on a diet of yellow corn meal 76, wheat gluten 20, calcium carbonate (C.P.) 3, and sodium chloride (C.P.) 1, supplemented every tenth day by 60 International Units of vitamin D as viosterol, were described and evidence was presented that it was a nutritional phenomenon preventable by some factor

present in large amounts in pig liver. Evidence is then presented indicating that this factor is riboflavin.

The congenital malformations as described (shortening of the tibia, mandible, fibula, radius and ulna, fusion of ribs, fingers, and toes, and cleft palate) were prevented by supplementing the diet with riboflavin, but not with thiamine hydrochloride, niacin, calcium pantothenate, and pyridoxine hydrochloride. On a more purified diet with the vitamin B complex furnished by crystalline vitamins, malformations appeared in the offspring only when riboflavin was omitted.

**Effect of age upon dark adaptation,** G. W. ROBERTSON and J. YUDKIN (*Jour. Physiol.*, 103 (1944), No. 1, pp. 1-8 illus. 2).—Results obtained in the measurements of dark adaptation (final rod threshold) in over 2,000 individuals between the ages of 10 and 70 have indicated a progressive lowering of the power of dark adaptation with advancing years. Data are reported illustrating this in a group of 758 factory workers (516 men and 242 women) ranging in age from 14 to 71 yr. The average increase in threshold for each 10 yr. of age was about 0.12 log unit. Between the ages of 20 and 30, the average increase was 0.10 log unit and, between 50 and 60, 0.15 log unit. The cause of this deterioration in dark adaptation is discussed, with the conclusion that the phenomenon can be explained entirely by the decrease in the size of the pupil with advance in age. It is pointed out that in setting up standards for comparison in assessing the general status of dark adaptation in a large group the effect of age should be taken into account.

**A survey of the vitamin and mineral content of bakers' cakes and pies,** D. MELNICK, B. L. OSER, and H. W. HIMES (*Cereal Chem.*, 20 (1943), No. 6, pp. 661-668).—"Fifty samples each of commercial cakes and pies were subjected to vitamin and mineral assays. In terms of calories furnished, 'average' cake carries from one-fifth to four-fifths of its nutrient load of thiamine, riboflavin, niacin, and calcium. However, in the case of iron, ample proportions are supplied. Cake may be enriched as readily as bread. Except for iron, fruit pies, likewise, are dependent upon other items in the dietary to compensate for their nutritional deficiencies. The custard and cheese pies furnish satisfactory quantities of vitamin A, thiamine, riboflavin, calcium, iron, and protein. Minimal standards for the enrichment of cake and pie are suggested."

**The problem of increase in vitamin content of agricultural products in view of improving the diet of the people,** E. LLESZ (*Internat. Rev. Agr. [Roma]*, 33 (1942), No. 7-8, pp. 265T-285T).—This review considers the vitamin requirements of man and the important task of agriculture and industry in producing foods to meet the vitamin needs of population groups. Intensive cultivation of plants rich in vitamins is recommended, some data being presented to show the relative importance of a number of fruits and vegetables as sources of ascorbic acid and in the case of peppers the relative importance of several varieties as sources of ascorbic acid, thiamine, and riboflavin. Factors influencing the vitamin content of foods, particularly fertilization, feeding practices, the manner of conserving forage, and artificial enrichment of food products are considered, and general suggestions are offered for the control of food vitamin resources for the international good. The bibliographic citations are drawn largely from German, French, and Italian literature.

**Effect of soybean phosphatides on utilization of the fat-soluble vitamins,** A. SCHAF and C. A. SLANETZ (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 1, pp. 159-161, illus. 1).—Attention is called to the report of Jensen et al. (E. S. R., 91, p. 620) in which the vitamin A-enhancing properties of crude soybean phosphatides are attributed to vitamin E rather than to an unidentified factor as postulated by the authors (E. S. R., 90, p. 134). A further series of tests is reported in which it was shown that the addition of *a*-tocopherol to the basal diet of the earlier work was

without effect and, furthermore, that the unknown factor in the crude soybean lecithin is also essential for vitamin E metabolism.

The effect of vitamin supplements on normal persons, J. M. RUFFIN and D. CAYER (*Jour. Amer. Med. Assoc.*, 126 (1944), No. 13, pp. 823-825).—To test the value of vitamin supplements on apparently normal, well-nourished subjects, 200 volunteer technicians and medical students were divided into 5 groups. The subjects in each of these groups were given daily for a period of 1 mo. tablets identical in appearance but differing in composition. One group received vitamin tablets and liver extract tablets, another vitamin tablets and yeast tablets, the third vitamin tablets and placebos, the fourth vitamin tablets, and the fifth placebos. The subjects, none of whom knew the nature of the supplements, were asked to keep records during the period of observation of appetite, energy and pep, general health, weight, gas and indigestion, abdominal pain, nausea and vomiting, and diarrhea. A statistical analysis of the records showed a significant increase in diarrhea and a highly significant increase in abdominal pain and in nausea and vomiting in the group receiving the liver extract and the yeast, but no significant differences in the other items.

Vitamin deficiency as an epidemiologic principle, W. L. AVCOCK and G. E. LUTMAN (*Amer. Jour. Med. Sci.*, 208 (1944), No. 3, pp. 389-406).—The idea that dietary deficiency is a factor in resistance to infection apparently has as its foundation (1) the long association between famine and pestilence, and (2) the association between vitamin A deficiency and xerophthalmia (not an infectious process itself but frequently followed by secondary infection). The epidemiological and experimental evidence bearing on the relation between famine and disease and between dietary deficiencies and xerophthalmia, virus infections, and the common cold are reviewed. "This review prompts the formulation of the proposition that vitamin deficiency as a factor in susceptibility to infection is not a general epidemiologic principle. The indications are that only deficiencies of certain vitamins affect susceptibility to certain types of infections, and that these occur only in limited areas where these vitamin deficiencies reach a sufficiently severe degree to produce tissue changes which are favorable sites for secondary infection."

Vitamin A in shark liver oils, S. SPRINGER and P. M. FRENCH (*Indus. and Engin. Chem.*, 36 (1944), No. 2, pp. 190-191).—Vitamin A potencies of liver oil from sharks and rays of the Florida region are reported in terms of U. S. P. units per gram. Livers of 21 species, mostly sharks and including males and females at different stages of maturity but mostly adult, were examined. The lowest value, 35 U. S. P. units per gram, was obtained for liver oil from the spotted eagle ray (*Stoasodon narinari*) and the highest, 340,000 U. S. P. units per gram, in the liver oil from one specimen of an adult female great hammerhead shark (*Sphyrna tudes*). It is pointed out that "the inclusion of liver oil from large rays generally could serve only to decrease the value of an oil mixture sold for its vitamin A content. Oil of lower than average potency may be obtained from assortments including livers from immature sharks, nurse sharks, tiger or leopard sharks, lemon sharks, great white sharks, and sawfish (a sharklike ray). Livers from large hammerheads, dusky sharks, and bull sharks may be worth special treatment as a source of relatively valuable oil; the balance of the catch should produce oil of slightly better than average potency."

Vitamin A was estimated with a Bills-Wallenmeyer electronic photometer and with a Lumetron photoelectric colorimeter calibrated to give results in accord with spectrophotometric determination of the extinction coefficient, using the conversion factor of 2,000 to convert to the  $E^{\text{1 cm.}}$  at 328 m $\mu$ .

Carotene and lycopene in rose hips and other fruits, F. C. JACOBY and F. WOKES (*Biochem. Jour.*, 38 (1944), No. 1, pp. i-ii).—This is a brief report of the results obtained with 28 varieties of rose hips, tomatoes, and *Solanum dulcamara* berries.

Carotene and lycopene were estimated separately by a combined phase separation and chromatographic method in which the pigments were extracted by grinding with quartz, petroleum ether, and acetone. The acetone was removed by washing with water in a continuous-flow apparatus. Xanthophylls were removed with diacetone and the carotenoids adsorbed on alumina and eluted with benzene. The benzene solutions of the separated carotene and lycopene were examined in the Hilger Nutting spectrophotometer and gave maxima in agreement with those obtained on pure specimens. The carotene and lycopene contents calculated from extinction coefficients amounted, respectively, to 40-240 µg. and 90-650 µg. per gram of rose hip flesh. Biological assay of a sample of dried rose hip extract prepared from *Rosa dumetorum* and *R. canina* after 9 months' storage at room temperature indicated vitamin A activity of 44 International Units per gram, which was in agreement with chemical assays.

**Homogenized liquid and dried eggs: Stability of vitamin A and carotenoids during dehydration and storage,** S. M. HAUGE, F. P. ZSCHEILE, C. W. CARRICK, and B. B. BOHREN. (*Indus. and Engin. Chem.*, 36 (1944), No. 11, pp. 1065-1068, illus. 2).—This paper, in extension of a preliminary report (E. S. R., 88, p. 856), presents the details of the spectroscopic studies of the carotenoid content and of the ultraviolet absorption measurements of commercial homogenized liquid and dried whole eggs. The results indicated that the sampling errors were small and that composite samples, prepared by combining samples of the liquid egg drawn at hourly intervals over a 6-hr. run from the bypass of the homogenizer or of the dried egg taken 3 min. later as it fell into the barrels for packing, were representative of individual samples. "Biological assays showed that losses of vitamin A potency during dehydration were negligible. Storage for 12 mo. at -18° C. caused no loss of potency. The losses at +5° were small. At +20°, room temperature, and warehouse temperature, losses were appreciable after 3 mo., but the rate of loss was greatly reduced during the next 9 mo. Spectroscopic observations were parallel to the biological results, and also indicated no loss of vitamin A or carotenoids during the periods of time required for biological tests. Typical absorption curves of egg extracts are interpreted in terms of vitamin A potent carotenoids."

**Absence of rapid deterioration in men doing hard physical work on a restricted intake of vitamins of the B complex,** A. KEYS, A. HENSCHEL, H. L. TAYLOR, O. MICKESEN, and J. BROZEK. (*Jour. Nutr.*, 27 (1944), No. 6, pp. 485-496).—In this investigation, following essentially the same procedures as in earlier studies from the same laboratory (E. S. R., 93, p. 100), eight normal young men were maintained on a rigidly controlled regime of diet, physical work, and exhaustive tests for 40 days, the first 21 of which were devoted to standardization of the subjects on an average intake of the B vitamins approximating the National Research Council standard allowances. For the next 14 days, the subjects were maintained on a constant basal diet providing an average of 0.16 mg. of thiamine, 0.15 mg. of riboflavin, and 1.8 mg. of niacin per 1,000 Calories; and received in addition capsules consisting of placebos for five of the subjects and an ample supply of yeast concentrate and synthetic B vitamins for the other three. During a final period of 5 days, all subjects received the vitamin supplements in addition to the basal diet. None of the men knew the contents of the capsules and none of those observing the test knew which of the subjects were receiving vitamin supplements and which only placebos.

In the 19 days of the test after the standardization period, the average intake was 4,640 Calories and the energy expenditure about 4,800 Calories daily. "Comprehensive clinical examinations, including electrocardiography and special ophthalmological details, were made at the start and at the end. A fixed schedule of repeated carefully standardized tests was maintained throughout. These included 12 objective

tests covering endurance, anaerobic work, speed, coordination, and muscle strength. Blood lactate and pyruvate were repeatedly measured at rest and at fixed intervals after standard exhausting anaerobic work. The urinary excretions of thiamine and of riboflavin were measured every few days. Psychological questionnaires were filled out by each man every other day. All results were in conclusive agreement that the vitamin intake and limitation were without effect on all the functions measured. Of all the variables measured and observed, only the vitamin excretion in the urine reflected the intake."

The report is followed by a discussion by Johnson et al., whose contrary findings in an earlier study have been noted previously (E. S. R., 89, p. 771).

**Biotin-pantothenic acid interrelationship in rats fed succinylsulfathiazole.** G. A. EMERSON and E. WURTZ (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 1, pp. 47-49).—Attention is called to reported observations of the need of folic acid and biotin for the utilization of pantothenic acid by rats receiving purified diets containing succinylsulfathiazole, and similar evidence is reported on the need of pantothenic acid for the utilization of biotin. "Biotin deficiency induced in weanling rats by the feeding of a succinylsulfathiazole containing purified ration may be aggravated by superimposing a deficiency of pantothenic acid. The feeding of biotin protected against these changes and, in addition, appeared to lessen the severity of the syndrome associated with a lack of pantothenic acid. Calcium pantothenate, fed prophylactically, was completely protective against deficiency signs usually associated with the absence of pantothenic acid. Furthermore signs of a mild degree only of biotin depletion were observed and the period required to produce such changes was extended beyond that observed in the absence of pantothenic acid. Rats receiving both biotin and calcium pantothenate were free from signs of both deficiency states."

**A study of the riboflavin and thiamine requirements of children of preschool age.** H. OLDHAM, F. JOHNSTON, S. KLEIGER, and H. HEDDERICH-ARISMENDI (*Jour. Nutr.*, 27 (1944), No. 6, pp. 435-446, illus. 2).—The average daily urinary excretions of riboflavin and thiamine by two normal 5-yr.-old boys were determined on various levels of intake of these vitamins as furnished by selected foods. The experiment ran continuously for thirty-six 3-day periods, with the exception of a 6-day period for one of the children. One-hr. fasting excretions, 4- and 24-hr. returns of test doses of both vitamins, and the thiamine content of the blood were also determined. The 1-hr. fasting excretions and the returns of the 4- and 24-hr. test doses were found to correlate well with each other and with the intakes of both riboflavin and thiamine. The correlation of blood thiamine with thiamine intake and other tests of nutritional status was poor.

The requirement for riboflavin was based on the establishment of the lowest level at which the daily excretions neither decreased nor increased progressively. For thiamine, the requirement was based on several items—an average daily excretion of 20 percent of the intake, a decided increase in the fasting 1-hr. excretions and test dose returns, and blood levels of 7.0 µg. or more per 100 cc. Intakes of 0.50 mg. per 1,000 calories of both thiamine and riboflavin satisfied these criteria. It is noted that for thiamine this value agrees well with the National Research Council recommended daily allowance for children of this age, while for riboflavin it is one-third less than the recommended allowance.

"Until such time as more data are available, the return in 4 hr. of 20 percent of a test dose of riboflavin and of 12 percent of a test dose of thiamine or fasting 1-hr. excretions of 9 µg. of riboflavin and 6 µg. of thiamine might be considered indicative of satisfactory nutritional status with respect to these vitamins."

**Vitamin interrelationships.—III, Influence of sub-optimum doses of thiamine on urinary excretions of riboflavin.** B. SURE. (Ark. Expt. Sta.). (*Jour. Nutr.*,

27 (1944), No. 6, pp. 447-452).—In this extension of the series noted previously (E. S. R., 89, p. 504), the effect of chronic thiamine deficiency rather than complete deprivation of the vitamin on riboflavin utilization by the rat was studied in a similar manner, with results indicating that "a definite thiamine-riboflavin interrelationship exists in chronic as well as in acute thiamine deficiency."

In discussing the possible significance of these findings in human nutrition, the author refers to the work of Ferrebee and Weissman both on rats and with human subjects (E. S. R., 92, p. 147) as unconvincing, and suggests that, "if any relationship between chronic thiamine deficiency and riboflavin retention exists in the human, evidence should be obtained from numerous cases of chronic borderline deficiencies in anorexias of children, polyneuritis of pregnancy, alcholic polyneuritis, and in patients suffering from cardiovascular dysfunction associated with B<sub>1</sub> avitaminosis."

Observations on genetic, physiological, and environmental factors affecting the vitamin C content of Maine-grown potatoes, E. F. MURPHY, W. F. DOVE, and R. V. AKELEY. (Maine Expt. Sta. and U. S. D. A.). (*Amer. Potato Jour.*, 22 (1945), No. 3, pp. 62-83, illus. 1).—In 1942, raw new potatoes of 54 varieties were found to contain ascorbic acid comparable to and sometimes exceeding that in field-grown tomatoes; 48 of them were grown in Aroostook County and the other 6 at Orono. The tested samples included 22 leading commercial varieties, 14 promising seedlings, 16 German varieties, and 2 wild forms from South America. The commercial varieties contained 22-38, the seedlings 20-40, and the German varieties 22-40 mg. ascorbic acid per 100 gm. fresh weight; individual tubers ranged from as low as 19 to as high as 45 mg. Varieties differed significantly among themselves. The same varieties exhibited significant seasonal variations in ascorbic acid content, and 13 of them grown in two localities had a correlation coefficient of  $+0.79 \pm 0.07$  between localities. There appeared to be no relationship between ascorbic acid values and size or shape of tubers, eye depth, starch content, or resistance to 13 common diseases. Twenty late-maturing varieties averaged  $3.8 \pm 0.56$  mg. per 100 gm. higher in ascorbic acid than 10 early-maturing sorts. As the late varieties were immature when dug, the physiological age of the tissue may have been responsible for the difference; also among this group there was a disproportionately large number of genetically superior varieties. Limited numbers of analyses were obtained on tubers of ancestrally related varieties. Those high and low in this vitamin resulted from the same cross (Katahdin  $35 \pm 0.37$  and Chippewa  $23 \pm 0.20$ ). The highest testing seedling variety came from two high parents. High parents tended to produce medium to high offspring and low parents to produce low progeny. All pink-eyed and pink-skinned varieties used tended to be low, with values below 30 mg. Yellow flesh color—sometimes indicative of vitamin A development—was not associated with unusual ascorbic acid values. There are 33 references.

Factors influencing the vitamin C content of potatoes, J. J. WESTAS (*Lantbr. Högsk. Ann. [Uppsala]*, 9 (1941), pp. 285-293).—The type of fertilization was found to have no decided effect on the ascorbic acid content of potatoes; the soil, on the other hand, proved to play a rather important role under certain conditions. In 1938, potatoes grown in sandy soil were richer in ascorbic acid than those from loamy soil; in 1940, which was very dry, there was no significant difference and what occurred was in the opposite direction. There were fairly great differences with regard to the content of this vitamin, as well as to the losses during storage, among some of the common varieties, comparisons being given for several. Losses from boiling unpeeled potatoes were very small.

Influence of sugars, fruit acids, and pectin on the oxidation of ascorbic acid, J. E. RICHARDSON and H. H. MAYFIELD (*Montana Sta. Bul.* 423 (1944), pp. 20).—The tests were carried out with a pure solution of ascorbic acid containing 10 mg.

per 100 cc., and the sugars (sucrose, dextrose), acids (citric, tartaric), and pectin were dissolved and added singly or in various combinations in proportions similar to those occurring in the canning of fruits and in jelly making. The influence of these components on the oxidation of the ascorbic acid in solutions boiled for different lengths of time was determined by analyses of the solutions before and after boiling. "Of the sugars, sucrose seemed to exert a protective influence on ascorbic acid oxidation, while crystalline dextrose showed a tendency toward a destructive influence. Citric and tartaric acids appeared to retard ascorbic acid oxidation—tartaric to a greater extent than citric. When citric and tartaric acids, in various combinations with sugars and pectin, were added to ascorbic acid solutions, tartaric acid continued to retard the oxidative process, but citric acid appeared to accelerate it. The addition of pectin alone to ascorbic acid solutions resulted in large oxidation losses, but these could be retarded by the addition of either sucrose or dextrose, and further retarded by adding tartaric acid. The same results were not obtained with citric acid."

Further studies on the vitamin C metabolism of preschool children, F. L. MEYER and M. L. HATHAWAY. (*Jour. Nutr.*, 28 (1944), No. 2, pp. 93-100).—This report covers an extension of earlier work (E. S. R., 85, p. 861) on the ascorbic acid requirement for saturation in preschool children, and a study of the effect of supplements of ascorbic acid, potassium citrate, and orange juice on the excretion and utilization of ascorbic acid. Eight healthy preschool children served as subjects in groups of four (two girls and two boys) in two successive years. Procedures, in general, were similar to those of the earlier study. The response to a 100-mg. supplement of ascorbic acid following periods on the basal diet, which furnished 23-25 mg. of ascorbic acid, was accepted as a means of estimating tissue saturation with the vitamin. None of the subjects excreted more than 37 percent of the intake on the first day; four excreted 60-73 percent in at least one test on the second day; and only one excreted over 64 percent in 48 hr. in both tests. The excretion values after adjustment to this high intake (100-mg. test dose plus 25 mg. in the diet) ranged from 50 to 87 percent for the eight subjects. This adjustment required from 2 to 4 days.

Utilization values for ascorbic acid (difference between intake and excretion) averaged 18 mg. as compared with 22 mg. in the earlier study. On the addition of 3.38 gm. of potassium citrate to the diet, the utilization of ascorbic acid was increased in five of the eight children on the basal diet alone and supplemented with the 100-mg. test dose, and in two others on the higher intake. On the substitution of orange juice for crystalline ascorbic acid and potassium citrate, the utilization of ascorbic acid was significantly increased in the four subjects studied.

The average pH values of the urine during the period of orange juice supplementation ranged from 6.0 to 6.2, as compared with 5.5 to 5.9 for the period on crystalline ascorbic acid and from 6.8 to 6.9 for the potassium citrate period, thus showing that the utilization of ascorbic acid was not directly related to the urinary pH.

Vitamin C and ability to work in hot environments, A. HENSCHEL, H. L. TAYLOR, J. BROZEK, O. MICKELSEN, and A. KEYS. (*Amer. Jour Trop. Med.*, 24 (1944), No. 4, pp. 259-265).—On the basis of three series of experimental studies on 44 normal young men under rigidly controlled conditions of diet, physical work, and environment with ascorbic acid intakes at two levels, 20-40 mg. and 520-540 mg. daily, the authors conclude that "there is no significant beneficial effect of high ascorbic acid intake on ability to work in the heat within the duration of our experiments. Our results do not prove that a high ascorbic acid intake may not be beneficial in a very prolonged stay in the heat. However, there is no acceptable evidence for such a long-time effect."

The vitamin C level of the blood plasma in guinea pigs, L. KAREL and C. W. CHAPMAN. (*Jour. Nutr.*, 28 (1944), No. 2, pp. 89-92, illus. 1).—

Determinations of the ascorbic acid content of the blood plasma of guinea pigs taken at different times and under different conditions are reported, with the conclusion that the determinations "are of value only when the time elapsing between the intake of the vitamin and the withdrawal of the blood sample is considered; that the initial value is not a reliable index of the state of vitamin C nutrition of the animal; and that, unless the sampling error is known, a correct interpretation of the experimental data cannot be made."

## TEXTILES AND CLOTHING

1944 Year Book of the American Association of Textile Chemists and Colorists, Vol. XXI (*New York: Amer. Assoc. Textile Chem. and Color.*, 1944, vol. 21, pp. 692, illus. about 95).—This volume, like previous numbers (E. S. R., 91, p. 231), is offered as a reference work, primarily for the textile chemist and colorist. In it are given the latest standard test methods of the association, a classified list of all dyestuffs currently manufactured in the United States, a similar list of chemical specialties, and a bibliography of articles on textile chemistry published during 1943.

Copper soaps as rot-proofing agents on fabrics, P. B. MARSH, G. A. GREATHOUSE, K. BOLLENBACHER, and M. L. BUTLER. (*Indus. and Engin. Chem.*, 36 (1944), No. 2, pp. 176-181, illus. 2).—The copper soaps, dissolved in a 3:1 mixture (by volume) of Stoddard's solvent and acetone, were applied by dipping the fabric, a bleached 8-oz. duck, in the solution and running it through a household clothes wringer provided with metal rollers. Strips of the copper-treated fabric and untreated control strips were subjected to soil burial and culture tests carried out in a room maintained at approximately 85° F. and 90-100 percent relative humidity. The *Metarrhizium* tests were carried out according to the procedure of Greathouse et al. (E. S. R., 88, p. 716), the *Chaetomium* tests by the procedure of Rogers et al. (E. S. R., 83, p. 428), and the culture tests with *Aspergillus niger* and *Penicillium* sp. by planting test strips on a thin mat of absorbent cotton placed in culture bottles and saturated with a liquid medium.

In these tests the copper naphthenate prevented rotting of the cotton fabric at lower concentrations than did copper oleate, copper "tallate", or copper hydrogenated resinate. The high preservative action of the copper naphthenate was apparently due to the fungicidal action of the naphthenate constituent, since (1) of the four soaps, only the copper naphthenate prevented the growth of the copper-tolerant fungus *A. niger*; (2) naphthenic acid itself prevented the growth of the test organisms and the fabric deterioration in the soil, whereas neither tallate oil, oleic acid, nor hydrogenated resin had protective value; and (3) fabric treated with copper naphthenate which had been drastically leached with dilute nitric acid until free of copper still prevented growth of *A. niger* and resisted soil deterioration. Fabrics treated with copper oleate, naphthenate, or tallate lost copper readily at point of contact with the soil, apparently due to solubilization by acid hydrolysis, by complex formation, and deactivation by chemical combination. Data from pure culture test procedures are contrasted with the results obtained by exposure to soils.

## HOME MANAGEMENT AND EQUIPMENT

Farm families' expenditures have gone up sharply (*Wisconsin Sta. Bul.* 465 (1944), pp. 6-8, illus. 1).—Records of expenditures of 106 farm families in 21 Wisconsin counties revealed that on the average the total money income per family from all sources, both farm and nonfarm, was \$1,577 in 1940 and \$3,004 in 1942. Farm expenses rose from \$944 to \$1,685. The average net money income was \$633 in 1940 and \$1,319 in 1942, while expenditures for family living in these 2 yr., respectively, amounted to \$459 and \$786. Analyses of the expenditures for these

2 yr. showed that the steepest percentage increases were for debt payment (from \$218 per family in 1940 to \$605 in 1942), medical care (from \$27 to \$59), and church contributions (from less than \$7 to more than \$14). "Other increases in expenditures included these: Food, \$182 to \$287; clothing, \$72 to \$127; house repair and operation, \$62 to \$116; household furnishings and equipment, \$35 to \$61; personal items such as haircuts, beauty parlor services, toilet articles, and tobacco, \$20 to \$25; gifts, \$10 to \$20; recreation, \$10 to \$15; expenses for newspapers, school and organizations other than church, \$8 to \$16." These increases indicate that the farm families interviewed raised their level of living between 1940 and 1942, although only a part of the increased expenditure actually went toward better living, the remainder being accounted for by higher prices. Farm families who spent an average of \$459 for family living in 1940 had to spend about \$585 to obtain a comparable living in 1942. Actually they spent \$786 for family living in the latter year, about \$126 of the \$327 increase going to meet the increased cost of living and the other \$201 to improve their living.

## REPORTS AND PROCEEDINGS

**Fifty-sixth Annual Report [of Georgia Station], 1944, H. P. STUCKEY.** (Partly coop. U. S. D. A. et al.). (*Georgia Sta. Rpt. 1944*, pp. 91, illus. 14).—In addition to work covered elsewhere in this issue, this report notes progress results for the year in agronomy, including fertilizers for cotton following *Lespedeza sericea*, sulfur in cotton fertilizers, effects of potash and borax on alfalfa, ammonium nitrate v. sodium nitrate, phosphate sources, treatments for eroded land, fertilizers and amendments for peanuts, corn and cotton seed disinfectants, inheritance of hard seed in beans, tests of Empire cotton for yield, thrips injury, and wilt resistance, cotton variety tests and breeding soybean varieties and culture, and value of Sanford wheat; animal husbandry, including home-grown roughages and sweetpotato meal in the dairy ration, concentrate feeding to dairy heifers on pastures, artificial insemination of dairy cows, tests of fattening beef cattle on peanut, kudzu, cowpea, and lespedeza hays, and shelled corn, cracked corn, and cracker wheat, supplementary feeds for beef cattle on pasture, wintering beef cattle, creep feeding beef calves, pit silos for sweetpotatoes and vines, potato meal for sheep, sheep breeding, control of stomach worms, nodular worms, sheep tick, and sheep louse, and peanut hay, kudzu hay, and green grazing for swine; pasture investigations, including grazing improved v. unimproved pastures by beef cattle, value of fertilizers, lime, and supplementary watering, winter grazing experiments, supplementary summer grazing crops, alfalfa varieties, and soil tests; botany, including peanut breeding, culture, and leafspot control, black rot of muscadine grapes, root rot of snap beans, breeding melons resistant to mildews and wilt, and tomatoes for disease resistance, and diseases of peas, vetch, lupines, and lespedeza; chemistry, including value of legume leaf meals, sorghum varieties for sirup, thiamine in peanut butter, peanut proteins, and calcium metaphosphate in chick rations; entomology, including the cowpea curculio, cotton boll weevil, pecan weevil, and DDT as an insecticide; food processing, including flavors and odors in frozen foods, freezing sweetpotatoes, value of home dehydration of vegetables and fruits, and preserving fruits and vegetables with sulfur dioxide; horticulture, including soil management in a peach orchard, muscadine grapes and grape rootstocks, sweetpotato culture, asparagus fertilizers and culture, and pimiento fertilizers; and results at the Georgia Mountain Substation with lettuce, onions, potatoes, cabbage, beans, oat varieties, potash-phosphate ash as a fertilizer, and sorghum bagasse silage as a wintering feed for cattle.

**Science for the farmer: [Fifty-seventh Annual Report of the Pennsylvania Experiment Station, 1944].—Supplement 1.** (Partly coop. U. S. D. A.).

(*Pennsylvania Sta. Bul. 464, Sup. 1 (1944), pp. 9, several illus.*).—In addition to several articles noted elsewhere in this issue, this supplement to the annual report contains Types of Farming in Pennsylvania Vary With Climate, Soil, and Market Demands, by P. I. Wrigley (pp. 1, 9); and Source of Vitamin D Determines Amount of Supplement Required in Turkey Feeds, by R. V. Boucher (pp. 2, 8), essentially noted previously (E. S. R. 92, p. 407).

Fifty-fourth Annual Report [of Washington Station], 1944, E. C. JOHNSON ET AL. (Partly coop. U. S. D. A. et al.). (*Washington Sta. Bul. 455 (1944), pp. 168+, illus. 1*).—Brief notes are given on progress results obtained in agricultural engineering, including poultry lighting and air conditioning, home dehydration, water heating, and germicidal lights for meat storage; agronomy, including variety tests of wheat, barley, oats, and flax, reaction of six strains of *Bromus carinatus* to head smut, observations of forage and turf species and mixtures, genetics and breeding of cereals and reaction of wheat diseases, crop rotations, weed eradication and control, alfalfa varieties and culture, sweetclover varieties, pea improvement, soybean and safflower culture, fertility of Washington soils and maintenance of organic matter, plant composition as influenced by fertilizers and soil types, effects of cropping system on leaching, utilization of fertilizers, and unproductiveness of orchard soils; animal husbandry, including the relation of thiamine in the ration of hogs to the thiamine and riboflavin in the tissues, protein and mineral supplements for pigs, adequacy of vitamin A for reproduction in sheep, grain feeding on pasture for beef production, feeding value of pea straw and grass hays, dried molasses beet pulp, and beet molasses, development of a bacon-type hog, sperm production and semen characteristics of rams, the anestrual season of ewes, and progeny testing of rams; chemistry, including fish byproducts for poultry, Ca, P, and vitamin D for chicks and poult, deficiencies in vegetable protein concentrates, cystine and methionine contents of feeds, nature of watery white in eggs, composition of grape juice, toxicity of lead arsenate spray residue for swine, stationary spray systems, eradication of spray oils, and spray residue analyses; dairy husbandry, including gas requirements of molds, cheeses suited for vacuum canning, variations in Bel Paese cheese, quality of dry milk solids for baking, value of proved sires, and rations for dairy cattle; entomology, including control of asparagus beetle, squash bug, potato flea beetle, weevils in peas, cabbage seed-pod weevil, cabbage aphid and maggot, spray concentrations, efficiency of sprays for orchard mites and scale insects, reducing quantities used of lead arsenate, spraying and banding for codling moth v. treatment of thinnings, cryolite and other cover sprays for codling moth, pear psylla survey, and control of pea moth, cabbage seed pod weevil, squash bug, and other pests by parasites; agricultural economics, including land classification and use, turkey production, work simplification in harvesting apples, farm indebtedness in Washington, postwar adjustments, and price trends; home economics, including vitamin A in butter, rancidity development in pork, home preservation processes for fruits, and effect of processing on thiamine content of lamb; horticulture, including orchard cover crops, vegetable seed production, potato breeding, the propagating of apples and pears by cuttings, winter injury, pollinizers for plums, breeding strawberries and raspberries, irrigation for apples, fruit spot and related diseases, orchard fertilization, breeding and fertilizing truck crops, variety tests of apricots, peaches, cherries, apples, plums, and nectarines, fruit storage studies, and breeding blueberries and cranberries; plant pathology, including field observations, leaf roll of potatoes, control of stem and root rots on peas, pea seed improvement, black root disease of beets, wheat and oat smuts, diseases of forage grasses, alfalfa failures, influence of crop sequence on diseases, seedling disease of flax, winter injury of apple trees, virus diseases of stone fruits, fruit spot and related diseases, strawberry and carnation yellows, and root rots of strawberries and raspberries; poultry husbandry,

including pasture and rations low in protein for turkeys, soybean oil meal in growing and laying rations, and protein levels and egg production; veterinary research, including mastitis, disinfectants for poultry farms, and poultry anthelmintics; and results at the branch stations, including at Lind variety tests with wheat, rye, barley, oats, and peas, spacing tests with wheat, tillage and soil moisture tests, and forage investigations; at Prosser, variety tests with alfalfa and grasses, corn, wheat, oats, barley, and soybeans, rotations, alfalfa and vegetable fertilizers, orchard irrigation, varieties of truck crops and fruits, wireworm investigations, irrigation rates and frequencies, and processing vegetables by freezing; at Wenatchee on dormancy sprays for pears, trials with DDT, sprays for apple powdery mildew, efficiency of spray protection, summer oil sprays for apples and cherries, orchard cover crops, pollination, fertilization, and fruit maturity; at Long Beach, on resanding cranberries, and control of fireworms and fruitworms; at the soil and water conservation station, on soil erodibility, plant covers, cropping and tillage practices in erosion control, and run-off; at the nursery division, Soil Conservation Service, on observations on grasses and legumes, alfalfa and sweetclover-grass mixture, pasture trials, and seed production of grasses and legumes; and at the U. S. Fruit and Vegetable Products Laboratory, on the canning of peaches and the froth flotation process for removing foreign material from vined canning peas.

From the Western Washington Station, divisional reports are made in agronomy on fertilizer placement, rates, and ratios, comparative value of phosphate carriers, inoculation of peas, boron deficiency of alfalfa and other crops, weed control, and green manure and cover crops; chemistry, including use of unslaked lime in peat moss poultry litter; dairy husbandry, including value of proved sires, composition of feeds, effect of iodinated casein on dairy cows, P supplement and liquid manure for pasture, roughages v. roughages plus concentrates for dairy cattle, and preserving roughage as silage; entomology, including cherry fruit flies, bulb mites, the cabbage seed pod weevil, maggot, aphid, and flea beetle, methyl bromide fumigation of cabbage transplants, the raspberry mite, the seed corn maggot as a pest of coniferous seedlings, scale propagation of Croft lilies and effect of chemical treatments on subsequent development, and the pea moth; grazing, including trials with cattle, toxicity of flat pea to sheep, clipping, germination, and inoculation trials with the flat pea, forage seedings, and a poison plant survey; horticulture, including breeding strawberries and raspberries, mechanical setting of strawberry plants, blueberry culture, variety tests of peaches, apples, plums, and grapes, potato breeding, and beet and cabbage culture, storage, and seed production; studies in Clark County with tree fruits and berries, peas, spinach for seed, fertilizers for cereal hay, and beets; plant pathology studies, including seed treatments, footrot of peas, *Heterosporium* leaf spot of spinach, basal rot of daffodils, tulip blight, gladiolus and lily bulb rots, leaf curl of peaches, cane blights of brambles, brown rot of stone fruits, black root and virus diseases of beets, strawberry yellows, root rots of strawberries, raspberries, spinach, stem rot of azaleas, and cabbage diseases; poultry husbandry, including grain in soybean oil rations, "pasting-up" in baby chicks, litter materials and management, eggshell quality and its inheritance, protein concentrates for fryer rations, electrical debeaking of pullets, and disease resistance; and veterinary science, including avian leucosis, sulfur and urea for cecal coccidiosis, pullorum disease, phenothiazine for enterohepatitis of turkeys and a survey of turkey diseases.

**What's new in farm science:** Annual report of the director [Wisconsin Station, 1944], I., compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul.* 465 (1944), pp. 64+, illus. 13).—In addition to several articles noted elsewhere in this issue, this section of the report presents progress findings on feeding the family, including prevention of ropiness in bread, home pasteurization of milk, new process for white "kitchenette" sauerkraut, using dried egg powder, chocolate milk v.

ordinary milk for growth, pellagra-preventing vitamin in coffee, B-complex vitamins in meat, refrigeration of dehydrated meat, soybeans as a protein source, riboflavin retention in well-prepared foods, breakfast foods as sources of vitamins and minerals, vitamin content of canned foods and losses in canning vegetables, and vitamin C retention in grape juice; nutrition—basic and general, including promotion of dental decay in cotton rats by sugar, building of B vitamins by butterfat and, in dogs, of niacin by milk and microbes, a precursor of niacin found in wheat products, rice bran, and sweetpotatoes, riboflavin in tears, fresh yeast a poor source of vitamins, amino acid content of meats, blood building accelerated by good rations, and relation of liver toxicity to excess vitamin A consumption; dairy products, including the production of high-vitamin milk with early cut corn silage, vitamins in cheese, cheese making with grass silage, starters in Swiss cheese making, partial pasteurization in cheese making, sediment in cheese, need of standardizing sediment tests, and production and use of butter oil; dairy cattle, including vaccination for trichomoniasis, transmission of the mastitis organism by hand milking, cobalt deficiency in cattle, anti-scours vitamin capsules, vitamin content of the blood as affected by sulfa drugs and Bang's disease vaccination, protein and starch as supplements to urea, and need of carbohydrates by cattle in building B vitamins; swine, poultry, and other animals, including need from birth of superior rations by gilts for breeding, availability of P in soybean oil meal, effectiveness of sulfadiazine for coccidiosis, factors associated with blackhead of turkeys, nutritional diseases of fur animals, and limitations of urea for rabbits; farm buildings and equipment, including cold pen barns for milk production, and a new tree-planting machine for reforestation; and special subjects, including improvement of quality hemp fiber by vat retting, production of legume cultures with agar substitute, failures to increase yield of citric acid from sugar, and an explanation of gram-stain differentiation.

## MISCELLANEOUS

List of publications of members of the staffs of Iowa State College from July 1, 1943, to June 30, 1944 (*Iowa State Col. Bul.*, 43 (1944), No. 27, pp. 43).—This list, compiled by the college library staff, consists of 328 citations by 230 faculty members.

**Dairy Research Digest [March 1945]** (*Dairy Res. Digest [Louisiana Sta.]*, 3 (1945), No. 1, pp. 4).—In addition to material noted previously or elsewhere in this issue, this number contains Late Soybeans Prove Best, by J. Gray (p. 1); Calhoun Herd Completes 15th Record, by D. M. Seath and D. M. Jones (p. 1); and Louisiana Results From Artificial Breeding, by D. M. Seath, G. D. Miller, and A. H. Groth (pp. 1, 2).

**Farm facts about flax, oats, livestock, poultry, land tenure.** (Partly coop. U. S. D. A.). (*North Dakota Sta. Bim. Bul.*, 7 (1945), No. 3, pp. 30, illus. 1).—In addition to articles noted elsewhere in this issue and brief notes and abstracts, this number contains Five Year Program of Agricultural Research, by H. L. Walster (pp. 1-7), a review of accomplishments of the station and substations; Scientific Papers of Staff Members, July 1, 1943, to June 30, 1944 (pp. 25-26); and North Dakota Farm Prices, by P. V. Hemphill (pp. 27-28).

**Farm and Home Science [March 1945]** (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 1, pp. 16, illus. 15).—In addition to several articles noted elsewhere in this issue, this number contains Fertilizer Recommendations for 1945, by H. D. Peterson and D. W. Thorne (pp. 1, 15-16); Turkey Production Becoming Major Farm Industry in Utah, by D. A. Broadbent (pp. 3, 12-13); Red Water Disease of Dairy Cattle Caused by Lack of Phosphorus in Ration, by C. W. Riggs (pp. 4, 12); and Turkey Brooder Death Losses Caused by Controllable Disease, by M. L. Miner (pp. 5-6).

## NOTES

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**Colorado College and Station.**—The fourth annual rural ministers' short course, sponsored by the college in cooperation with the Home Missions Council and the Colorado Council of Churches, was held July 9-14. A special series of evening meetings, open to the general public, considered the Asiatic background to peace.

The annual cattle feeders' day at the U. S. Dry Land Field Station near Akron is to be replaced by radio programs.

Dr. Charles R. Jones, associated with the department of entomology and zoology since 1914 and its head since 1933, retired in July. The department has been divided, Dr. George M. List becoming head in entomology and Dr. Wendell Krull in zoology.

Inga M. K. Allison retired on July 1 as head of the division of home economics after nearly 30 years' service, and has been succeeded by Dr. Flora L. Slocum of the U. S. Social Security Board. Dr. Elizabeth Dyar has been appointed vice dean of the division. Dr. W. E. Pyke, professor of food research, has been appointed head of the college department of chemistry and chief of the chemical section of the station. Dr. Robert Kunkel has succeeded Dr. J. G. McLean as professor of horticulture and horticulturist.

**Connecticut University and Storrs Station.**—Howard A. Rollins, professor of horticulture and extension fruit specialist since 1930, has been appointed head of the department of horticulture vice Sherman P. Hollister, retired after 40 years' service. Dr. E. L. Minard, assistant professor of animal diseases, has resigned to accept a position in the School of Medicine of St. Louis University.

**Iowa College and Station.**—Dr. Charles A. Bower, research assistant professor of soils, has accepted a position with the U. S. D. A. Bureau of Plant Industry, Soils, and Agricultural Engineering with headquarters at Riverside, Calif. Dr. William D. Gray has been appointed assistant professor of botany.

**Louisiana Station.**—C. W. Du Bois, research associate in food preservation, has resigned to engage in commercial work.

**Minnesota University and Station.**—According to a note in *Science*, H. K. Wilson, professor of agronomy and agronomist, has been appointed head of the department of agronomy in the Pennsylvania College and Station.

**New Hampshire Station.**—The department of horticulture is studying the movement of nutrients in horticultural plants as determined with the aid of radioactive elements. The project has two objectives: (1) To determine technics for the broader use of radioactive elements as tracers in the study of nutrient translocation in plants, and (2) to determine the rate and direction of nutrient movement in horticultural plants at different seasons of the year. The engineering experiment station at the university and the radioactive center at the Massachusetts Institute of Technology are cooperating.

**Rutgers University and New Jersey Stations.**—Dr. Victor A. Tiedjens has resigned as associate professor of vegetable gardening and associate olericulturist to become director of the Virginia Truck Station.

**New York State Station.**—The continuation for 3 years is announced of a grant from the Nutrition Foundation, Inc., for studies on the chemical changes that take place in the transformation of carbohydrates, such as sugars and starches, into fat. These changes have a direct nutritional importance, and the solution of what takes place may also aid in the understanding of fatty degenerative diseases and of diabetes. The station is using in its studies a mold which forms large amounts of fat from carbohydrate and which is believed to be the same mold used in Germany

during the war to supply fat demands. It is expected that the studies with this organism can be extended eventually to the same chemical mechanism in higher plants and animals. The Sugar Research Foundation has also made a contribution in support of this work.

A new technic has been developed for making bacteriophage visible under the microscope with the use of certain stains and ordinary light. This method makes it possible to observe how bacteria are killed by bacteriophage by studying living material under the new phase difference microscope.

**North Carolina College and Station.**—The department of experimental statistics has been expanded into an institute of statistics. An appropriation of \$87,000 has been made by the General Education Board for the support of the institute during the ensuing 5 years, and supplementary funds have been received from Federal, State and other agencies. The present program includes graduate and undergraduate and extension instruction, research, cooperation with the U. S. Department of Agriculture and other institutions and organizations, consultation, and as a regular service the analysis of data gathered by the experiment station and co-operating agencies. The North Carolina research office of the Division of Agricultural Statistics, U. S. D. A. Bureau of Agricultural Economics, has from the beginning of the work formed an integral part of the laboratory. In addition to two members of that bureau and the director, the staff of the institute includes five associate and assistant professors and four technical assistants.

**Washington College.**—Dr. R. G. Heifer, instructor in physiology in the department of veterinary medicine, has accepted a research position in the College of Agriculture of the University of California, with headquarters at Davis.

**West Virginia Station.**—Dr. F. D. Cornell, Jr., acting head of the department of agricultural economics, has been appointed assistant director of the station.

**Wisconsin University and Station.**—Recent grants for research include \$4,000 for studies on the quality in barley, \$500 on the effectiveness of copper fungicides in the control of orchard diseases, \$500 on the comparative nutritive value of butterfat and competing fats, and \$5,500 for fellowships in biochemistry and animal and dairy husbandry.

The retirement on July 1 is noted of Dr. E. B. Hart, professor of biochemistry, Harry D. Tiemann, lecturer in forest products, and Dr. Dorothy R. Mendenhall, lecturer in home economics. *Wisconsin Country Magazine* notes that Dr. I. W. Rupel, associate professor of dairy husbandry, has accepted an appointment as head of the department of dairy husbandry in the Texas College.

**Office of Experiment Stations.**—Sybil L. Smith, principal experiment station administrator on foods and nutrition, retired on June 30. She had been in the Office since 1918, when she joined the abstracting staff of *Experiment Station Record*. Her original assignment was in agricultural chemistry and agrotechny. This was later modified to include biological chemistry, veterinary medicine (for a time), foods and human nutrition (since 1919), and more recently home economics education, textiles and clothing, and home management. She had become widely recognized as an authority on the literature of foods and nutrition, and especially on the status of vitamin research, on which and related subjects she has written extensively.

Since the passage of the Purnell Act in 1925 she had given increasing attention to the development of home economics research in the State experiment stations. In this capacity she had exercised a wide influence among home economics workers and their organizations. In 1938 she served as the representative from the United States in the conference on national nutrition sponsored by the League of Nations and held in Geneva, Switzerland. During the war years she has helped to coordinate and promote cooperative research by the experiment stations in the Nation-wide studies on the nutritive value of foods.

**U. S. Department of Agriculture.**—Among the staff of the Bureau of Plant Industry, Soils, and Agricultural Engineering to be retired as of June 30 were Dr. Clyde E. Leighty, principal agronomist in charge of dry-land investigations since 1930 and associated with the Department since 1906; John S. Cole, senior agronomist in the same division since 1908; Stephen H. Hastings, principal agronomist in the division of irrigation agriculture since 1930, and with the Bureau since 1928; Harry T. Edwards, vegetable fiber specialist since 1917, and previously fiber expert, assistant director of agriculture, and director of agriculture for the Philippine Government from 1902 to 1917; and John W. Roberts, principal pathologist in orchard disease investigations since 1935, who has been associated with the Bureau since 1909 and a member of the editorial board of the *Journal of Agricultural Research* since 1930. Of these, Mr. Edwards, who since the outbreak of World War II has been prominently identified with the development of marine cordage material essential to the needs of the Army and Navy, will continue to serve the Department in an advisory capacity.

The death on May 1 at the age of 61 years is noted of John B. Shepard, senior agricultural statistician in the Bureau of Agricultural Economics, who came to the Department as a member of the crop reporting board in 1924; and on June 5 of Dr. Merton B. Waite, then in his eighty-first year, and widely known as a pioneer plant pathologist from 1888 to his retirement in 1935.

**Research Appointments in Latin America.**—Dr. N. E. Winters, of the U. S. D. A. Office of Foreign Agricultural Relations, has been designated as director of the cooperative agricultural experiment station of El Salvador. Andrew F. Freeman, biological chemist in the same Office, has been assigned to the cooperative agricultural experiment station in Peru to assist in investigations designed to improve the production of strategic complementary crops. Virgil C. Pettit, agricultural engineer in the Office, has been assigned to the cooperative agricultural experiment station in Nicaragua, where he will direct agricultural engineering and construction work and also assist in the same type of work at the cooperative experiment stations in Guatemala and El Salvador.

A. O. Rhoad, animal husbandman in charge of the Iberia Livestock Experiment Farm at Jeanerette, La., has been appointed chief of the division of animal industry of the Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica.

**Sugar Research Foundation Grants.**—Additional grants of \$45,400 have been announced. Among these are \$20,000 for the Ellen H. Richards Institute of the Pennsylvania State College to measure the effect of high and low sugar-containing diets upon the health, growth, and physical condition of children; and \$4,000 to the Natural Resources Research Institute of the University of Wyoming to investigate the utilization of pectin from the pulp of sugar beets and to study derivatives of beet pectin.

**Authorization of Additional Funds for Cooperative Agricultural Extension Work.**—Under an act signed by President Truman on June 6, 1945, Title II of the Bankhead-Jones Act of 1935 is amended by the addition of a new section authorizing the appropriation of additional funds to develop the cooperative extension system set up under the Smith-Lever Act of 1914. These funds may include \$4,500,000 for the fiscal year ending June 30, 1946, \$8,500,000 for 1947, and \$12,500,000 for 1948 and each subsequent fiscal year. The sums so appropriated are to be paid to the several States and Hawaii under the same conditions as other additions to the Smith-Lever funds, except that not more than 2 percent may be available for paying the expenses of the U. S. D. A. Extension Service; \$500,000 is to be allotted among the States and Hawaii (but not more than 10 percent to any one of these) by the Secretary of Agriculture on the basis of special needs due to population characteristics, area in relation to farm population, or other special problems; and the remainder is to be paid to the several States and Hawaii in the proportion that the

farm population of each bears to the total farm population as determined by the Census of 1940. All funds received by the States and Hawaii under this Act must be matched by them on a dollar-for-dollar basis, and compliance with the matching provisions of earlier legislation is a prerequisite to participation. The specific objective of the Act is enunciated as the development of "cooperative extension work in agriculture and home economics, including assistance to farm people in improving their standards of living; assistance in developing individual farm and home plans, better marketing and distribution of farm products, work with rural youth in 4-H Clubs and older out-of-school youth, guidance of farm people in improving farm and home buildings, development of effective programs in nutrition, and for the necessary printing and distribution of information in connection with the foregoing."

**New Journals.**—*Biometrics* is being published bimonthly by the American Statistical Association, 1603 K St., N. W., Washington 6, D. C., as the official organ of the biometrics section of the association. Gertrude M. Cox, director of the Institute of Statistics of the North Carolina College, is chairman of the editorial committee. The initial number contains an account of this institute (see p. 238), a paper on Some Uses of Statistical Methods in Medicine, by J. R. Miner, an abstract section, and other material.

*World's Poultry Science Journal* is being published quarterly in Ithaca, N. Y., as the official organ of the World's Poultry Science Association by a committee headed by Dr. M. A. Jull, together with Drs. L. E. Card, J. H. Martin, and L. W. Taylor, and J. W. Kinghorn, and with Dr. G. F. Heuser as editor. Much of the initial issue is devoted to a discussion of prewar conditions in the poultry industry abroad.

# EXPERIMENT STATION RECORD

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## RECENT WORK IN AGRICULTURAL SCIENCE<sup>1</sup>

### AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Digestion of raw starch, A. K. BALLS and S. SCHWIMMER. (U. S. D. A.). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 203-210+, illus. 1).—Uncooked starch may be readily and completely digested by a mixture of extracts of hog pancreas and of *Aspergillus oryzae* ("mold bran"). The break-down of the starch granules may be observed without difficulty under the microscope. Both the pancreas and mold preparations contain thermolabile factors (presumably enzymes). An inorganic factor present in the ash of wheat flour was necessary for rapid digestion, but calcium chloride could be used instead of this ash. Approximately all of the starch was converted to sugars. The products of the digestion were glucose and maltose, the former predominating. The mold bran was the source of maltase. The optimum pH of the digestion was about 5.2. Temperatures up to 55° [C.] were permissible with the quantities of enzyme used. Starches were found to vary in the readiness with which they are broken down, potato starch being relatively resistant compared to corn and wheat starches. The size of the starch grains did not appear to be a determining factor in this resistance.

The optical activity of the copper complexes of polysaccharides and substituted methyl glucosides, R. E. REEVES. (U. S. D. A.). (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 49-55).—The four possible monomethyl  $\beta$ -methylglucopyranosides were found to show widely different optical behavior when dissolved in cuprammonium hydroxide solution. The optical activity of methyl 2-methyl- $\beta$ -glucoside in water and in the cuprammonium solution so closely resembles that of the polysaccharide from *Phytomonas tumefaciens* that it is suggested that this polysaccharide is composed of glucopyranose units linked chiefly through the 2 position. The optical behavior of a three-linked polysaccharide and several four-linked polysaccharides was found similar to that of the correspondingly substituted methyl glucosides.

The shift in the optical rotation of glucopyranoside polysaccharides upon being dissolved in cuprammonium hydroxide solution may be used to classify glucose polysaccharides and may, in certain instances, furnish information regarding the structure of the polysaccharide.

<sup>1</sup> The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

A proteolytic inhibiting substance in the extract from unheated soybean meal, W. E. HAM and R. M. SANDSTEDT. (Nebr. Expt. Sta.). (*Jour. Biol. Chem.*, 154 (1944), No. 2, pp. 505-506, illus. 1).—Extracts made with dilute acid at pH 4.2 were found to contain a substance which greatly retarded the activity of trypsin *in vitro*. These extracts could be quite largely deproteinized by precipitation by kaolin without loss of activity of the proteolytic inhibitor. The substance could be further purified by precipitation of the supernatant liquid from the kaolin-treated extract with 60-percent acetone and reextraction of this precipitate with water. Most of the proteolytic inhibition was destroyed, however, by precipitation of the kaolin-treated extract with 60-percent ethyl alcohol. Likewise, no inhibiting activity was found in the extracts from raw soybean flake previously soaked in 45-percent alcohol. Activity of the proteolytic inhibitor was lost upon dialysis of the extracts and was destroyed by autoclaving either the soybean meal or the extracts. The inhibitor secured by the precipitation with acetone and reextraction with water appeared quite unstable under ordinary conditions.

It was shown that a factor causing growth retardation in chicks can be extracted from unheated soybeans with dilute acid (pH 4.2), leaving a residue which compares favorably in nutritive value with heated or autoclaved beans.

The action of 1,2-epoxides on proteins, H. FRAENKEL-CONRAT. (U. S. D. A.). (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 227-238).—Such epoxides as ethylene oxide, propylene oxide, and epichlorohydrin were found to be suitable reagents for the esterification of protein carboxyl groups in aqueous solution at room temperature. Through treatment of crystalline egg albumin and  $\beta$ -lactoglobulin with these compounds, preparations of modified protein were obtained.

The derived proteins showed isoelectric points which had been shifted as much as 3 pH units toward the alkaline side. They were insoluble in the isoelectric region, both in distilled water and in salt solutions. They were more soluble on the acid side than on the alkaline side of the isoelectric point. They contained considerably fewer free carboxyl, phenolic, primary amino, and sulfhydryl groups than the untreated proteins. The decreases of these various types of groups varied greatly, but in a predictable manner, depending upon the conditions of treatment. Their nitrogen contents depended upon the type and length of treatment. The lowest values observed with the two proteins were 13.4 and 12.7 percent of nitrogen, which indicated the introduction of approximately 80 and 120 moles of reagent per mole of egg albumin and  $\beta$ -lactoglobulin, respectively. In the case of egg albumin, the calculated figure agreed with that to be anticipated from the number of substituted groups as found by the various analyses. With  $\beta$ -lactoglobulin, the number of reagent residues accounted for by group analyses was lower than that indicated by nitrogen determinations. The total number of the basic groups was not appreciably affected by the treatment. Any difference in the basic character of the original amino groups and of the newly formed imines did not appear. In general, the newly introduced bonds were surprisingly stable in acid and alkaline solution, but small proportions of the substituted carboxyl and amino groups were hydrolyzed readily in acid and alkali, respectively.

Composition of casein in milk, G. A. RAMSDELL and E. O. WHITTIER. (U. S. D. A.). (*Jour. Biol. Chem.*, 154 (1944), No. 2, pp. 413-419, illus. 1).—A new procedure for obtaining the elementary composition of casein consists in isolating the calcium caseinate-calcium phosphate complex from milk by means of the supercentrifuge, analyzing the complex, and from the results calculating the percentage content of the elements of the casein. This procedure avoided separation and alteration of the casein by chemical means, and thus prevented loss of phosphorus and sulfur. Otherwise, the percentage composition of casein as determined by this procedure did not differ appreciably from values previously given.

On the basis of the increase in alkalinity of the complex by the addition of neutral potassium oxalate, the complex was found to contain 4.80 percent  $\text{Ca}_2\text{P}_2\text{O}_7$  and 95.20 percent calcium caseinate. The calcium caseinate fraction of the complex contained 1.18 percent calcium. A series of calcium caseinates was prepared from grain curd casein and the percentages of calcium were plotted against the pH of 3 percent dispersions prepared from them. The curve indicated that a caseinate of 1.18 percent calcium content would yield a pH of 6.40, only 0.07 pH more acid than the pH of the milk from which the complex was obtained.

The tryptophane and tyrosine content of peanut proteins, W. L. BROWN. (Ga. Expt. Sta.). (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 57-61).—Traces of nitrates and nitrites, especially the latter, present in the sulfuric acid used were found to interfere with the determination of tryptophan by the glyoxylic acid method. A satisfactory grade of sulfuric acid was obtained by distilling the acid in a conductivity water still. The results of determinations of tryptophan and tyrosine in peanut proteins are given.

Comparison of crude and purified preparations of a leucylpeptidase associated with beef muscle, S. SCHWIMMER. (U. S. D. A.). (*Jour. Biol. Chem.*, 154 (1944), No. 2, pp. 361-366, illus. 2).—A highly active specific enzyme capable of hydrolyzing leucylglycine and leucylglycine, but not simple glycine or alanine peptides, was found associated with beef tissue. Its properties were compared with those of a crude glycerol extract of beef muscle. The properties investigated indicated that the purified enzyme is a leucylpeptidase. The starting material contained more than one peptide-splitting enzyme.

Aromatic sulfonic acids as reagents for peptides: Partial hydrolysis of silk fibroin, W. H. STEIN, S. MOORE, and M. BERGMANN (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 191-201, illus. 1).—The solubility of a series of peptide salts of aromatic sulfonic acids was investigated, and the applicability of these reagents to the isolation of peptides was shown. From a partial hydrolysate containing dipeptides, glycyl-*L*-alanine and *L*-alanylglycine were isolated by the successive use of 2,5-dibromobenzenesulfonic acid and 2,6-diiodophenol-4-sulfonic acid.

Amino acids of isinglass, J. M. R. BEVERIDGE and C. C. LUCAS (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 547-556).—Values for 20 amino acids in isinglass were determined, and their totals were found to account for 96.6 percent of the protein, or 83.2 percent of the total nitrogen.

The synthesis of pregnanediol 3- $\beta$ -*d*-glucuronide, C. F. HUEBNER, R. S. OVERMAN, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 615-617).—The naturally occurring uronic acid conjugate of pregnanediol was shown by synthesis to be pregnanediol 3- $\beta$ -*d*-glucuronide. The synthesis of pregnanediol 20-acetyl-3-(tetraacetyl- $\beta$ -*d*-glucoside) and stigmasterol triacetyl- $\beta$ -*d*-glucuronide methyl ester is also described.

The synthesis, some derivatives, and the metabolism of  $\alpha,\gamma$ -diketo-*n*-octanoic acid, A. L. LEHNINGER. (Univ. Wis.). (*Jour. Biol. Chem.*, 153 (1944), No. 2, pp. 561-570).—The synthesis of  $\alpha,\gamma$ -diketoctanoic acid was achieved by using an extension of methods available for lower homologs. The structure of the product was demonstrated. Several derivatives of pyrazole nature were obtained from the free acid and ethyl ester by reaction with substituted hydrazines.

The degree of intestinal absorption of sodium  $\alpha,\gamma$ -diketoctanoate was found to be small. Experiments with surviving rat tissue slices showed no evident biological utilization of the compound. Broken cell preparations of rat liver were able to oxidize the compound at a low rate.

The isolation and properties of some naturally occurring octadecenoic (oleic) acids, R. C. MILLCAN and J. B. BROWN. (Ohio State Univ.). (*Jour. Biol. Chem.*, 154 (1944), No. 2, pp. 437-450).—Octadecenoic acids, isolated by low tem-

perature crystallization of the C<sub>18</sub> methyl esters of a number of fats and oils and lipides of animal and vegetable origin, were compared with oleic acid made by similar methods from olive oil.

The octadecenoic acids of chicken fat, and of peanut, cottonseed, corn, and linseed oils appeared to be identical with the oleic acid of olive oil. The octadecenoic acids of lard, beef tallow, beef adrenal phosphatides, pork liver lipides, human fat, and, to a somewhat lesser extent, soybean and rapeseed oils appeared, on the basis of the low melting points of the original preparations, the even lower melting points of certain filtrate fractions obtained by crystallization of these specimens, and the melting points of the dihydroxy acids, to be mixtures of oleic acid with other isomeric octadecenoic acids, oleic acid being the principal component of these mixtures. These results appear to confirm the previously reported presence of vaccenic acid in beef fat and lard.

**Rôle of phosphate in pyruvic acid dissimilation by cell-free extracts of Clostridium butylicum**, H. J. KOEPSELL, M. J. JOHNSON, and J. S. MEEK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 535-547).—The preparation from *C. butylicum* of a large supply of cell-free, dried water extract of frozen cells, which catalyzes pyruvic acid fermentation, is described. Thirty-six percent of the activity of the frozen cells was recovered in the dried extract.

Phosphate balances of the fermentation of pyruvic acid by enzyme extract in the presence and absence of glucose are given. It was found that in the absence of glucose inorganic phosphate is taken up and appears as labile phosphate, but no stable phosphorylation product accumulates. In the presence of glucose no labile phosphate accumulates, but inorganic phosphate is taken up and appears as stable ester phosphate. Silver-precipitable acetic and butyric acids were present in purified labile-phosphate preparations. The labile phosphate appeared to be a mixture of acetyl and butyryl phosphates. Silver-precipitable butyric acid, apparently butyryl phosphate, was formed by incubation of acetyl phosphate with butyric acid in the presence of enzyme extract. An exchange of the phosphate group between acetyl phosphate and butyric acid apparently occurred, yielding acetic acid and butyryl phosphate.

**Reversibility of the phosphoroclastic split of pyruvate**, M. F. UTTER, C. H. WERKMAN, and F. LIPPMANN. (Iowa Expt. Sta. et al.). (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 723-724).—An enzyme preparation obtained by grinding *Escherichia coli* with powdered glass was incubated with formic acid containing an excess of C<sup>14</sup> and with pyruvic acid containing normal amounts of C<sup>14</sup>. At the end of 60 min., the unchanged pyruvic acid contained a considerable excess of C<sup>14</sup> in the carboxyl group. The C<sup>14</sup> in the carboxyl group and in the residual formic acid were approximately equal, showing that an equilibrium had been reached. Since the formic acid was not in equilibrium with CO<sub>2</sub>, as evidenced by the very small excess of C<sup>14</sup> in the CO<sub>2</sub>, C<sup>14</sup> did not enter into the pyruvic acid by means of a combination of CO<sub>2</sub> and some other compound.

**Regeneration of heat-inactivated peroxidase**, S. SCHWIMMER. (U. S. D. A.). (*Jour. Biol. Chem.*, 154 (1944), No. 2, pp. 487-495, illus. 1).—The regeneration of peroxidase as a function of time and temperature was found to be largely a function of the heating rate, to have a positive temperature coefficient, and to be a time reaction. Factors essential for regeneration were found to exist both in the precipitate formed upon heating and in the supernatant solution. Reappearance of the enzyme after heat treatment is held to involve resolution of an insoluble component, recombination with a soluble group, and reversion of enzyme protein to its native state.

Vegetables contain several peroxidases which vary in their activities towards iodide and pyrogallol. An untreated vegetable juice could be characterized by the

determination of these activities. The precipitate formed when the juice was heated carried these characteristic properties with it.

**Microbiological method for the quantitative determination of small quantities of potassium, M. Rogosa.** (U. S. D. A.). (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 307-308).—A *Lactobacillus casei* culture designated No. 7469 was found to respond quantitatively to additions of small quantities of potassium in an otherwise suitable medium lacking this element. The components of the medium are specified. The assay procedure was similar to that of microbiological methods for the assay of vitamins and amino acids. Especially purified KCl was used in the medium, and a standard curve was constructed from the results of acid production or pH change at levels of 0γ, 1γ, 2γ, 3γ, 4γ, 5γ, 6γ, 8γ, 10γ, 12γ, and 14γ of K<sup>+</sup> per milliliter of medium.

**The determination of blood plasma iron, G. KITZES, C. A. ELVEHJEM, and H. A. SCHUETTE.** (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 653-660, illus. 1).—A method has been devised to measure the plasma iron. The difficulties encountered because of the precipitation of the plasma proteins by trichloroacetic acid were obviated by a simple procedure in which the proteins are denatured by heat before being precipitated by the trichloroacetic acid. One washing of such a precipitate appeared to recover all the iron. α,α'-Bipyridine was used to measure the iron colorimetrically in the range of 1γ-4γ. When an acetic acid-acetate buffer at pH 4.6 was used, the color formation was instantaneous.

The plasma iron could be determined with a maximum error of ±10 percent for blood plasma containing from 30γ to 90γ percent of iron, and with a maximum error of ±5 percent for blood plasma containing from 100γ to 200γ percent of iron.

**Modification of the chlorate digestion method for microdetermination of iodine in biological materials, B. K. SHAHROKH.** (Univ. Calif.). (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 517-520).—The material is digested in a solution of perchloric acid, sodium chlorate, and disodium hydrogen phosphate. The liquid is made alkaline by the addition of sodium hydroxide to precipitate iron, calcium, and copper as phosphates, which are removed by centrifugation. The clear liquid is then acidified with hydrochloric acid to a pH of 1.2, with thymol blue as an indicator. At this pH in the presence of phosphate, ferric salts do not oxidize potassium iodide. The indicator is decolorized with a solution of chlorine in carbon tetrachloride. Chlorine is removed by boiling, the solution is cooled, a crystal of phenol is added, and the solution is allowed to stand for 5 min. Such concentrations of manganese salts as are found in tissues will then be reduced by the phenol. Iodine is liberated by the addition of potassium iodide solution. The pH of the solution is adjusted to about 6 by the addition of disodium hydrogen phosphate solution. At this pH no iodine will be liberated from the potassium iodide solution and the titration can be carried out as slowly as desired; and an almost neutral solution will safeguard against the oxidation of potassium iodide by slow oxidizing agents that might be present in the solution as impurities. Titration is effected with 0.001 N sodium thiosulfate solution freshly prepared before titration.

**Determination of ammonia evolved from α-amino acids by ninhydrin, D. A. MACFADYEN** (*Jour. Biol. Chem.*, 153 (1944), No. 2, pp. 507-513).—A method for determination of the ammonia evolved from primary α-amino groups of amino acids when they react with ninhydrin in boiling aqueous solution at pH 2.5 is described. The yields of ammonia, after removal of ninhydrin, were constant. Glycine and alanine, however, yielded only 0.86 and 0.90 mole of ammonia, and tryptophane underwent an anomalous reaction, yielding only 0.34 mole of ammonia. Under the conditions described, β-alanine and α-glucosamine were inert to ninhydrin and urea yielded no ammonia.

The use of dyes for the determination of acid and basic groups in proteins, H. FRAENKEL-CONRAT and M. COOPER. (U. S. D. A.). (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 239-246).—Microanalytical methods for the estimation of the number of acid and basic groups of proteins were based on the tendency of the polar groups to bind dyes of the opposite charge, resulting in a precipitation of the protein-dye complex. The acid dye, orange G, combined stoichiometrically with basic protein groups in a buffer of pH 2.2. The basic dye, safranine O, reacted with acid groups at pH 11.5, but the extent of combination was in this case slightly affected by protein concentration and other factors. The number of protein groups binding these dyes corresponded well with the total number of basic (guanidyl, imidazole, amino) and acid (carboxyl, phenol, thiol) groups of crystalline egg albumin and  $\beta$ -lactoglobulin and, approximately, with those of several crude proteins studied.

The proposed micromethods were found applicable to both soluble and insoluble proteins, and proved useful in the interpretation of the action of various chemical agents on proteins.

Cystine determination in proteins and foods, F. A. CSONKA, H. LICHTENSTEIN, and C. A. DENTON. (U. S. D. A.). (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 571-576, illus. 1).—The wavelength of minimum transmission for the red "color complex" produced in Sullivan's method (E. S. R., 70, p. 444) for cystine was found to be 505 m $\mu$ . Evidence of the stoichiometric relationship between naphthoquinone and cystine in Sullivan's cysteine reaction is presented. The color produced in Sullivan's cysteine reaction was shown to follow Beer's law.

A spectrophotometric method for the determination of cystine in proteins and food materials is described. It consists of a modification of a mercaptide precipitation and the Sullivan colorimetric method.

Use of the spectrophotometer in the determination of cystine by Sullivan's reaction, R. J. EVANS. (Wash. Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 373-378, illus. 3).—The Sullivan reaction (E. S. R., 70, p. 444) for the determination of cystine was adapted for use with the spectrophotometer. Maximum differences in transmittance between a blank and a cystine solution treated by this procedure were obtained at wavelengths of 490-500 m $\mu$ . Most consistent results were obtained when the solutions contained between 25 and 150 p. p. m. of cystine, when they were adjusted to a pH of 1.0 with a pH meter, when all reagent solutions were freshly prepared before use, when the time between adding the reagents was held constant, and when the color reading was made between 10 and 40 min. after the last reagent was added.

Experiments on the activation of ficin, T. WINNICK, W. H. CONE, and D. M. GREENBERG. (Univs. Idaho and Calif.). (*Jour. Biol. Chem.*, 153 (1944), No. 2, pp. 465-470).—A solution of crystalline ficin retained its activity when freed completely of cysteine by anaerobic dialysis or when freed of H<sub>2</sub>S or HCN by evacuation in an atmosphere of nitrogen. Aerobic dialysis of the activated enzyme resulted in an almost complete loss of activity. This was largely restored when activators were again added.

The results support the view that ficin is active in a reduced form and inactive when oxidized by oxygen or other oxidants. The apparent coenzymic function of cyanide and sulphydryl compounds appeared actually to consist in the protection of the enzyme against inactivation by oxidation or by combination with heavy metals.

The enzymatic determination of glutamine, R. M. ARCHIBALD (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 643-656, illus. 1).—The enzymatic method for the determination of glutamine described is specific for glutamine in the absence of purine nucleoside derivatives bearing NH<sub>2</sub> groups. The evidence presented indicates that the concentration of interfering substance in dog and human plasmas is

negligible, and that the method can be used to determine the concentration of glutamine in plasma. Two analytical procedures are described. In that designated the "filtrate" procedure, the proteins are removed from the digest and the ammonia in the filtrate is determined with Nessler's solution. In a "distillation" procedure, the ammonia is distilled at 38°–42°C. in vacuo and the distillate is nesslerized. The distillation method is the more accurate.

The glutamine values obtained by the enzymatic method indicated a range of glutamine amide nitrogen content from 0.6 to 1.0 mg. per 100 cc. or from 6 to 10 mg. of glutamine per 100 cc. of normal human plasma. Values down to 0.2 mg. were obtained in pathological plasma. In dogs, the values in systemic plasma ranged from 7 to 13 mg. of glutamine per 100 cc. Glutamine was measured also in synovial fluid and in dialysates of chicken egg whites and yolks.

**Preparation and assay of glutaminase for glutamine determinations,** R. M. ARCHIBALD (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 657–667, illus. 2).—The author describes a procedure for the preparation from kidneys of a glutaminase extract which liberates ammonia quantitatively from the acid amide group of glutamine. Such an extract is sufficiently active and specific for use as an analytical reagent to determine glutamine in blood plasma. Addition of potassium cyanide was found to enhance the activity of the glutaminase and to retard the liberation of ammonia from asparagine and the action of  $\alpha$ -deaminase. The optimum pH of the dog kidney glutaminase was found to be 7.5. From pH 7.0 to 8.3 the activity exceeded 90 percent of the maximal. The action of the enzymes was entirely inhibited at a pH below 6.

A procedure for assaying glutaminase activity is based on the inverse relation between activity of enzyme and time required to decompose a given amount of substrate.

**The histidine content of adult and fetal bovine hemoglobin,** H. B. VICKERY. (Conn. [New Haven] Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 283–287).—Determination of the histidine yielded by samples of crystallized hemoglobin derived respectively from the blood of the adult and from that of the fetus of the cow has shown with a high degree of probability that there is a difference in the amino acid composition of these proteins. Adult bovine hemoglobin yielded  $6.81 \pm 0.05$  percent of histidine, fetal bovine hemoglobin yielded  $6.43 \pm 0.04$  percent. Comparison of the present observations with the results of previous determinations of histidine in the hemoglobins of adult human, horse, and sheep blood, likewise made by the 3,4-dichlorobenzenesulfonate method, showed that all of these kinds of hemoglobin differ from each other in histidine content.

**The determination of histidine with the aid of 3,4-dichlorobenzenesulfonic acid,** H. B. VICKERY and J. K. WINTERNITZ. (Conn. [New Haven] Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 211–229).—Histidine is quantitatively separated from the mixture of amino acids produced by the hydrolysis of proteins by precipitation as its silver compound, and is isolated as the crystalline bis-3,4-dichlorobenzenesulfonate without further treatment of the histidine fraction. This substance is purified by recrystallization. Losses from adsorption upon inorganic precipitates are thus minimized, while losses due to the solubility of the salt are compensated by correction by a quantity equal to the constant loss in weight observed after repeated recrystallization of the dichlorobenzenesulfonate under the experimental conditions adopted. The purity of the isolated compound is established by the decomposition point, the nitrogen content, and the constancy of its solubility.

Recoveries of known amounts of histidine under experimental conditions that closely resemble those encountered in actual analytical operations were shown to be, in general, within 3 percent of quantitative. Except with proteins of very low histidine content, the reproducibility of individual determinations was between

2 and 3 percent. Analyses of a number of proteins gave results that confirm remarkably closely the early data obtained by Kossel and Kutscher (E. S. R., 58, p. 12) and by others using similar methods or a colorimetric method.

The failure to confirm a number of determinations of histidine in proteins carefully made by one or another of the modifications of the Kossel procedure "suggests that these modifications have not in fact resulted in improvement in accuracy. Whether the low results to which they lead arise from losses due to the extensive use of inorganic precipitants, or to the inadequacy of flavianic acid as a reagent for the quantitative isolation of histidine, is not certain, but it is clear that flavianic acid should now be discarded for this purpose."

**Hydroxyleucines**, H. D. DAKIN (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 549-555).—The author isolated from a mixture of amino acids obtained from casein a compound having the empirical formula and chemical behavior of an hydroxyleucine and capable of reduction to *l*-leucine. The compound yielded almost none of its nitrogen as ammonia on oxidation with periodic acid, an observation which practically ruled out the  $\beta$  position for the hydroxyl group, leaving the  $\gamma$  and  $\delta$  positions possible. The author then developed a new synthesis in order to obtain the  $\gamma$ -hydroxy-compound (racemic) for comparison with the naturally occurring *l*-amino acid. The differences between the synthetic and the natural compounds were much too large with reference to several properties to be accounted for by the optically inactive state of the synthetic compound.

The synthesis of  $\gamma$ -hydroxyleucine, which forms the principal subject of this paper, was effected by the condensation of acetylaminomalonic acid diethyl ester with isobutyl oxide by means of dry sodium methylate, with hydrolysis and concomitant decarboxylation by boiling the condensation product with hydrochloric acid. The yield of once-crystallized product amounted to about 50 percent of the theoretical.

**Chemical studies on powdered keratins**, B. EDWARDS and J. I. ROUTH (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 593-596).—When the keratins of human hair, turkey feathers, duck feathers, chicken feathers, and porcupine quill were ground in a steel ball mill, a marked decrease in the cystine content of the powdered material was observed. The nitrogen and sulfur content of the keratins was not appreciably affected. Aqueous extracts contained increasing amounts of nitrogen, cystine, inorganic sulfates, and partially oxidized sulfur compounds. Mechanical degradation of these keratins was apparently accompanied by oxidation, as was evidenced by the decrease in cystine sulfur and the presence of one-fourth to one-half of the water-soluble sulfur in the form of inorganic sulfates.

**The estimation of methionine in protein hydrolysates and human urine**, A. A. ALBANESE, J. E. FRANKSTON, and V. IRBY (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 293-302, illus. 1).—A method for the rapid and convenient determination of methionine in protein hydrolysates and urine is based on the hydrogen peroxide oxidation of methionine. The use of the oxidation reaction for the characterization of sulfur compounds is discussed.

**A study of the various procedures for the estimation of tryptophane**, M. X. SULLIVAN and W. C. HESS (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 441-446).—The authors found that the great divergence among findings of the tryptophan content of casein, with values ranging from 0.51 to 2.4 percent, is due mainly to the different rates of color development of free tryptophan and tryptophan combined in the protein. The values of 2 percent and more are held to result from comparison of the color generated by the standard and unknown at points other than those at which color formation is maximum.

By employing *p*-dimethylaminobenzaldehyde and using the maximum readings in the Klett-Summerson photoelectric colorimeter, filter 54, the tryptophan content of casein was found to be between 1.2 and 1.3 percent. These values were corroborated by four different procedures.

**A micromethod for the determination of acetone and ketone bodies**, L. A. GREENBERG and D. LESTER (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 177-190, illus. 2).—A rapid, sensitive, and accurate method for determining acetone in air and biological fluids is based upon the reaction of acetone with 2,4-dinitrophenyl-hydrazine to form the corresponding hydrazone, the separation of the hydrazone by extraction with carbon tetrachloride, and its colorimetric determination in this fluid. The method, with modifications described, affords rapid and accurate determination of the total and of individual ketone bodies.

**On the determination of esterified cholesterol**, A. E. TEERI. (N. H. Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 279-281).—The author has shown that the color produced in the Liebermann-Burchard reaction by the esterified cholesterol of calf blood is, within certain limits, greater by a definite percentage than that produced by the same quantity of free cholesterol. Hence, by application of an appropriate correction factor, it is possible to determine, with reasonable accuracy, total and esterified blood cholesterol without saponification.

Calf blood samples were analyzed for total cholesterol after saponification and for apparent total and esterified cholesterol without saponification according to the method described. Free cholesterol was calculated by difference in the latter case and is a true value because the increase in color due to the ester was the same in the determinations both of the total and of the esterified fractions. The free cholesterol was then subtracted from the figure obtained for total cholesterol by the saponification procedure, leaving the true value for esterified cholesterol. In 100 samples of blood plasma from 29 calves, the esterified cholesterol of calf blood produced, on the average, approximately 25 percent more color with the Liebermann-Burchard reagents than did the same quality of free cholesterol.

**Concerning the reinecke method for the determination of choline**, D. GLICK (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 643-651, illus. 2).—The light-absorption characteristics of acetone solutions of Reinecke salt, choline reineckeate, and acetyl-choline reineckeate were determined over the range 360 to 1,000 m $\mu$ . Each step in the reineckeate method for the determination of choline was examined in detail. The procedure finally adopted included simplifications and improvements in certain of the steps.

**The determination of free choline in animal tissues**, R. W. LUECKE and P. B. PEARSON. (Tex. Expt. Sta.). (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 507-512).—An adaptation of a microbiological method for the estimation of free choline in animal tissues is described. Values for free choline in fresh beef liver as determined in this way ranged from 0.08 to 0.20 mg. per gram. This represents about 2 percent of the total choline in the liver. For the determination of total choline, the values given by the microbiological method agreed well with the values obtained by chemical methods.

**Manometric determination of formic acid**, M. J. PICKETT, H. L. LEV, and N. S. ZYGMUNTOWICZ (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 303-315).—The authors describe a procedure for the manometric determination of formic acid by oxidation with ceric sulfate in the presence of catalytic quantities of palladium. The error in the determination of 0.5 mg. of formic acid was less than  $\pm 3$  percent. Compounds which might interfere in this determination were investigated, and methods for determining formic acid in samples containing these compounds are given. The procedure was shown to give satisfactory recoveries of formic acid in bacterial cultures and suspensions.

**The direct determination of 5-keto-d-gluconic acid**, W. E. MILITZER. (Univ. Nebr.). (*Jour. Biol. Chem.*, 154 (1944), No. 2, pp. 325-330, illus. 4).—In a method for the determination of 5-keto-d-gluconic acid in which the rate of reaction with a modified Benedict's reagent at 25° [C.] is employed, d-glucose, 2-keto-d-gluconic acid, and other monosaccharides do not interfere with the determination, nor do

sodium chloride, sodium sulfate, sodium nitrite, and potassium chloride. The reagent is not reduced by formaldehyde, acetaldehyde, formic acid, pyruvic acid, levulinic acid, and uronic acids.

A method for the quantitative determination of hemoglobin in tissues, A. GREENBERG and D. ERICKSON. (*Univ. Minn.*). (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 679-682, illus. 1).—A colorimetric method for the quantitative determination of hemoglobin in lung, heart, and liver tissue is described, together with tests of its reliability.

**Urinary steroids:** Use of the periodic acid reaction in the measurement of non-ketonic steroids obtained after various types of hydrolysis, N. B. TALBOT and I. V. EITINGON (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 605-617, illus. 4).—A procedure for the quantitative oxidation of 17,20-dihydroxy steroids, to 17-ketosteroids is outlined. Assays of the 17-ketosteroids thus formed and of the usual preformed 17-ketosteroids were carried out on extracts of urine which had been hydrolyzed with the aid of barium chloride, an enzyme preparation, or hydrochloric acid, respectively. The hydrolysates of the barium chloride and enzymatic procedures contained both preformed 17-ketosteroids and nonketonic substances which could be assayed colorimetrically after conversion into 17-ketosteroids by periodic acid. On the other hand, while the hydrolysates obtained after hydrochloric acid hydrolysis also contained preformed 17-ketosteroids, they were devoid of substances from which 17-ketosteroids could be formed with the aid of periodic acid.

**Manometric, titrimetric, and colorimetric methods for measurement of urease activity,** D. D. VAN SLYKE and R. M. ARCHIBALD (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 623-642, illus. 3).—Egg albumin was shown to protect urease in dilute solutions from inactivation. The original manometric and titrimetric procedures for measuring urease activity were modified for application to the more active urease preparations now available. A simple colorimetric procedure was founded upon the observation that the speed with which pH is raised in a specified phosphate-urea solution serves as a measure of the rate of ammonium carbonate formation, and of urease activity.

## AGRICULTURAL METEOROLOGY

An annotated bibliography on some early uses of punched cards in meteorology and climatology, M. C. GEORGE (*Amer. Met. Soc. Bul.*, 26 (1945), No. 3, pp. 76-85).—The period 1921-32 is covered.

Cyclogenetic arcs on the Pacific coast, A. B. CARPENTER (*Amer. Met. Soc. Bul.*, 26 (1945), No. 3, pp. 72-73, illus. 1).—In this study of the major effects of Pacific coast topography, it is concluded that the concave arcs of the coast favor cyclogenesis and the convex arcs tend to weaken eastward-moving disturbances.

Notes on the determination of the effectively possible duration of sunshine, H. NEUBERGER. (Pa. State Col.). (*Amer. Met. Soc. Bul.*, 26 (1945), No. 3, pp. 74-75, illus. 1).—In view of the lack of a uniform and satisfactory definition of the duration of sunshine as well as of uniform recording methods, the general use of the percentage of effectively possible sunshine as determined by the Maurer-Conrad method seems advisable as more representative of the true sunshine conditions, since at least part of the instrumental deficiencies can thus be eliminated. To preclude the possible effect of inconsistent meteorological phenomena, such as haze, careful selection of the peak values should be combined with utilization of the symmetry of the effectively possible sunshine around the solstices.

An instrument for recording the rate of rainfall or the wind velocity, J. R. BIBBY (*Roy. Met. Soc. [London], Quart. Jour.*, 70 (1944), No. 306, pp. 277-279, illus. 3).—An instrument is described which records the number of times an electrical circuit is made and broken in successive 2-min. intervals. This can be

arranged to give an autographic record of the rate of rainfall, or, in conjunction with a cup anemometer, of the wind speed."

**Ecologia agraria [Agricultural ecology],** G. Azzi (*Genova (Genoa): Soc. Anonima Editrice D. Alighieri, 1944, pp. 204, illus. 20*).—The main features of this book relate to the concept of meteorological equivalents and agricultural climatology, agrogeology and the soil series, the yields and ecological classification of crop plants, and differential analyses of yields. A bibliography of over eight pages is included. See also an earlier note (E. S. R., 62, p. 314).

**Sunspots, rainfall, and the price of cotton,** E. G. MISNER (*Cornell Univ., Dept. Agr. Econ., A. E. 476 (1944), pp. 27+, several illus.*).—All forecasts made in this study are on the basis of information available before the period covered by the forecast. The sunspot number used is for the year preceding the one for which rainfall is used. The May, June, and July rainfall data are available the first week in August. A low sunspot number (below 40) indicated a dry year (less than 105 percent of normal) correctly 78 percent of the time—a ratio of 3:1. A dry year predicted a decline in the price of the New York December cotton future during August-December correctly 64 percent of the time (2:1). A high sunspot number of 40 or more indicated a wet year (105 percent or more of normal) correctly 56 percent of the time (3:2), but a wet year predicted a rise in the price of the New York December cotton future during August-December correctly 81 percent of the time (4:1). As an average, the sunspot prediction of a dry or wet season the succeeding year for May, June, and July in the Cotton Belt was correct 67 percent of the 54 yr. 1889-1942 (63 per cent when less than 100 = dry, 100 or more = wet). The prediction from rainfall of a rise or decline in price of the December future at New York during August-December was correct 70 percent of the time for the same period. A prediction that the New York December cotton future would rise in wet years and fall in dry years during August-December, and that in years when this prediction was wrong the July future during December-July would do just the opposite, was correct for 46 yr., or 85 percent of the past 54 yr.—a ratio of about 6 right to 1 wrong. Based on anticipated sunspot numbers and, from these, the expected rainfall, it thus appears that some dry years may now be expected in the Cotton Belt; a dry year favors a good yield of cotton. An appendix tabulates the rainfall over periods of years for the corn belts of the United States and Argentina, respectively.

**Oats and climate in southern Ontario,** M. B. ZACKS (*Canad. Jour. Res., 23 (1945), No. 2, Sect. C, pp. 45-75, illus. 17*).—The effects of monthly rainfall and temperature during the growing season on yields of oats were studied by the correlation coefficient and isopracit technics. Cool and wet Junes and Julys were found to be the most important features for high subsequent yields, their degree of significance varying, however, according to latitude and topography. A system of 13 zones, each more or less homogeneous in these respects, is discussed for the southern Ontario region. Suggestions are made for future improvement of varieties in the poorer areas, as well as for more reliable crop and climatic statistics. A historical (46 references) summary is given of similar work elsewhere, and the results are compared with the present findings.

## SOILS—FERTILIZERS

**Methods of collecting and preparing soil samples,** M. G. CLINE. (*Cornell Univ. (Soil Sci., 59 (1945), No. 1, pp. 3-5)*).—Methods of sampling soils, first, to represent an area for estimates of mean values only, estimates of variability, and estimates of significance and fiducial limits and, second, to represent a soil type are presented. Instructions for subdivision of areas and selection of sampling sites are included. The relative merits of general types of sampling tools are pointed out. A method for the preparation of samples for analysis is given.

[Soil Survey Reports, 1934, 1937, and 1938 Series] (U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. [Soil Survey Rpts.], Ser. 1934, No. 27, pp. 146+, illus. 12; 1937, No. 13, pp. 69+, illus. 10; 1938, No. 6, pp. 42+, illus. 4).—These surveys were made in cooperation with the State experiment stations as respectively noted: 1934, No. 27, Huntington County, Pa., H. W. Higbee et al. (Pa. Expt. Sta.); 1937, No. 13, Kittitas County, Wash., L. H. Smith et al. (Wash. Sta.); and 1938, No. 6, the Big Horn Valley area, Mont., F. K. Nunn (Mont. Sta.).

Physical land conditions, [Surveys Nos. 35 and 37] (U. S. Dept. Agr., Soil Conserv. Serv., Phys. Land Survey Nos. 35 (1944), pp. 39+, illus. 13); 37 (1945), pp. 28+, illus. 17).—Survey No. 35, by J. Bennett, deals with Clark County, Ga.; No. 37, by R. W. Ruble, with the Kent Soil Conservation District, Md.

The electro-chemistry of soil formation.—V, A lysimeter study of podzolic solvation and precipitation, S. MATTSON and E. KOUTLER-ANDERSSON (*Lantbr. Högsk. Ann. [Uppsala]*, 10 (1942), pp. 241-257, illus. 5).—This is a continuation of a series previously noted (E. S. R., 84, p. 588).

Solvation and precipitation in podzolic materials were studied in laboratory lysimeters by placing samples from the various soil horizons in layers in large filter tubes and leaching with water and with dilute salt solutions. In one series, the samples were mixed as when the soil is cultivated. In the layered series, there was an eluviation of dark-colored organic matter and of sesquioxides from the acidic upper layers and an illuviation in the lower B-horizon layers which are rich in basoids and have a higher isoelectric point. The most basic layer from the B<sub>a</sub> horizon adsorbed the solutes most efficiently. In the mixed series, there was a great solvation in the mixtures from the upper soil horizons, but when the lower B-horizon materials were included the systems showed a much greater stability.

The exchangeable bases of two Missouri soils in relation to composition of four pasture species, C. E. MARSHALL (*Missouri Sta. Res. Bul.* 385 (1944), pp. 60).—The Putnam silt loam and the Lindley silt loam showed differences in exchangeable Ca, Mg, Sr, K, and Na. The manganese reserves were also found differently distributed in the two soils, the Lindley soil having much exchangeable manganese, an element of which acids liberated only moderate further quantities. The Putnam soil had a much lower content of exchangeable manganese but relatively large quantities liberated by acid treatment. Experiments on limited exchange against acid showed that sodium treatments produced a well marked complementary ion effect, whereas potassium, magnesium, and calcium treatments did not.

Analyses of bluegrass, redtop, sweetclover, and Korean lespedeza indicated generally that: (1) The complementary ion principle does not, in general, seem to govern the uptake of the divalent ions strontium, calcium, and magnesium when the crops are grown on soils with potassium or sodium additions; (2) uptake of manganese by the crops depends largely on the pH of the soil and on the exchangeable manganese present; (3) uptake of sodium and potassium was but little affected by additions of Ca or Mg to the soil, but sodium additions definitely increased the potassium in the crops; (4) the total cations per 100 gm. dry matter, calculated in equivalents, were relatively constant under various treatments, such variations as were found agreeing qualitatively with similar variations in nitrogen content and somewhat less closely with variations in phosphorus; and (5) among the four crops there were differences in uptake of the various elements, the Korean lespedeza being notable for its very low sodium content, which could not be increased to 0.06 percent even by sodium additions, and also for its relative constancy in regard to the other cations.

Fertilizers and manure in the improvement and maintenance of soil productivity in southern Nevada, G. HARDMAN (*Nevada Sta. Bul. 171* (1944), pp. 38, about 25 illus.).—On the desert soils of southern Nevada (in their virgin state—usually low in organic matter, lacking in bacteria, and often high in soluble salts), large applications of barnyard manure promoted growth somewhat the second season, and were notably effective thereafter. The best single reclamation practice for the first 2 or 3 yr. was that of frequent and abundant irrigations, most effective when the entire ground surface was completely flooded. A dense-growing crop provided an insulating ground cover, aided in securing an even spread of water, and greatly assisted in reclamation. Alfalfa and sweetclover were usually preferred, but Bermuda and other dense-growing grasses also served well. Cultivated crops were difficult and expensive to grow during reclamation and of less value in the reclamation program than ground cover.

No marked need for nitrogen or potassium for field crops on these soils was apparent. The soil of the station farm began to need phosphorus after about 3 yr. in crops. For the entire period of the trials, phosphorus increased the yield of corn about 20 percent, alfalfa and clover about 60 percent. Manure began to be effective the second year. In the average of all the trials it increased the yields of corn about 40 percent, of alfalfa and clover about 90 percent, and other crops proportionately. Manure effectively promoted good soil tilth and structure and increased moisture-holding capacity. On truck crops, phosphorus caused a considerable increase in yield, earliness, and quality. Manure and organic nitrogen also tended to increase yield. Radishes responded to organic nitrogen but showed little response to phosphorus. About 500 lb. of treble superphosphate was effective for alfalfa. A single such treatment greatly increased the yields for 2 yr. and was still somewhat effective the third season. Manure greatly reduced the water requirement per pound of dry matter of alfalfa. Phosphorus also reduced the water requirement, though less than did manure; but neither nitrogen nor potassium appeared to have any significant effect.

The value of liquid manure for pasture, F. B. WOLBERG, A. A. SPIELMAN, and V. L. MILLER. (*Coop. U. S. D. A. (Washington Sta. Bul. 457* (1945), pp. 19).—Diluted liquid manure was applied to each plot of the treated pasture immediately after each grazing period. Dry matter yields and chemical composition of the herbage were determined from clippings taken from ungrazed areas. Total digestible nutrients yields were calculated from the nutritive requirements of grazing heifers and milking cows.

The use of liquid manure on upland mineral soil pastures for 5 yr. increased the yield of total digestible nutrients by 15.1 percent, or 28 standard cow days per acre. On bottomland muck soil, liquid manure treatment for 3 yr. resulted in an 18.9 percent increase of total digestible nutrients. The percentage increase from the liquid manure plus treble superphosphate was 38.3. No apparent increase in yields of nutrients resulted from the application of the phosphate fertilizer alone to the bottomland muck soil pastures, but the addition of phosphate and liquid manure resulted in a 16.2 percent increase of total digestible nutrients over that produced by liquid manure alone. The potassium content of the herbage grown on the liquid-manure-treated pastures was consistently higher than that from the untreated pastures. The potassium content of the herbage increased each succeeding year. Slightly higher phosphorus content of the herbage was consistently observed on the phosphate-treated pastures, either with or without liquid manure.

Low grade potash salts for alfalfa, L. G. WILLIS (*Res. and Farming [North Carolina Sta.], 3* (1945), *Prog. Rpt. 2*, pp. 6, 7, 11).—It was found that low-grade potash fertilizers commonly containing 20–25 percent of potash are very helpful in protecting plants from wilting in very dry soils, since their high chloride content

seems to prevent wilting. In the greenhouse, the soil mixture at the wilting point, with no treatment was 0.60 percent; with the 20-percent potash salt, 0.13 percent; and with sodium chloride, 0.18 percent.

Effect of different soil colloids on the toxicity of boric acid to foxtail millet and wheat, P. L. GILE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 10, pp. 339-346).—Eight soil materials which contained colloidal materials with silica-sesquioxide ratios ranging from 1.07 to 3.41 were used. The toxicity of boric acid in each of several soil-sand mixtures containing sufficient soil to supply 1 percent of soil colloids was almost exactly the same as in pure quartz sand, indicating that soil colloids do not fix boric acid in a form unavailable to the plants. The toxicity of boric acid was also unaffected by variations in the quantities of sulfate and phosphate in the basic fertilizer and by substitution of an all-nitrate fertilizer for one containing two-thirds of the nitrogen as nitrate and one-third as ammonium.

Commercial fertilizers report for 1944, E. M. BAILEY (*Connecticut [New Haven] Stu. Bul.* 483 (1944), pp. 48).—This bulletin refers to some of the earliest fertilizer laws (Connecticut, Maryland, and Massachusetts), and presents the official definitions together with 1944 fertilizer analysis data. It is noted that 91 percent of all guaranties made have been met substantially, a record felt to be commendable under wartime conditions and to compare favorably with normal performance.

#### · AGRICULTURAL BOTANY

Division of plant biology, H. A. SPOEHR ET AL. (*Carnegie Inst. Wash. Yearbook*, 43 (1943-44), pp. 65-83).—Included are reports of progress in investigations of chlorellin, by H. A. Spoehr, J. H. C. Smith, H. H. Strain, H. W. Milner, and G. J. Hardin (pp. 66-69); experimental taxonomy, by J. Clausen, D. D. Keck, and W. M. Hiesey, including the depletion of the western range, breeding of range grasses, taxonomy and distribution of *Poa*, biological characteristics of *Poa* and breeding technic, periodicity and disease resistance, cytology, hybridization, and testing of hybrids of *Poa*, physiology of climatic races of *Achillea*, and miscellaneous studies (pp. 69-81); desert investigations by F. Shreve (pp. 81-82); and paleobotany, by R. W. Chaney (pp. 82-83).

Apparatus for growing microorganisms on a flowing medium, R. W. LEWIS and E. H. LUCAS. (Mich. State Col.). (*Science*, 101 (1945), No. 2623, pp. 364-365, illus. 1).—It is believed that the apparatus described and illustrated can become a useful laboratory tool for studying certain organisms (results with *Penicillium notatum* and *Bacillus brevis* briefly noted), and that if a better type of tubing (cellulose tubing used) can be secured it may become adaptable to the production of antibiotics and toxins.

A study of cultural methods for the quantitative determination of bacterial populations of distillery mashes, J. C. GAREY, L. A. RITTSCHOF, L. STONE, and C. S. BORUFF (*Jour. Bact.*, 49 (1945), No. 3, pp. 307-310, illus. 1).—The method described is said to be easier to run than the plate count technic and the data to be more reliable. The method can be used successfully for culture counts of grains and water.

Some effects of metallic ions on the metabolism of *Aerobacter aerogenes*, D. PERLMAN. (Wis. Expl. Sta.). (*Jour. Bact.*, 49 (1945), No. 2, pp. 167-175).—Preparation of a bacteriological medium low in metallic cations was accomplished by passing the nonionic portion of the medium over a cationic exchange column. When this medium was fermented by *A. aerogenes*, a redistribution of the fermentation products occurred. The amounts of acetic and formic acids and of ethyl alcohol formed were decreased; the amounts of lactic acid and CO<sub>2</sub> increased. A

reversion to the "normal" fermentation was accomplished by adding Mn and Cr ions to the purified medium; adding Zn, Cu, Al, and Fe caused a partial reversion. When the metallic ions were added to the purified medium, they had little effect on the synthesis of riboflavin, biotin, and niacin by this organism. Adding Mn or Al at a level of 10 µg. per liter increased the amount of vitamin B<sub>c</sub> (or substances with B<sub>c</sub> activity) synthesized, but the same levels of Cu, Fe, and Zn decreased its synthesis. Adding Zn, Cu, Mn, Cr, or Al at a level of 10 µg. per liter increased the amount of pantothenic acid synthesized. There are 24 references.

**Assimilation of glucose and related compounds by growing cultures of *Pseudomonas saccharophila*,** R. WHELTON and M. DOUDOROFF. (Univ. Calif.). (*Jour. Bact.*, 49 (1945), No. 2, pp. 177-186).—The authors found that whereas synthesis during growth with some substrates (glucose) does not differ greatly from the "primary synthesis" exhibited by resting cell suspensions, with other substrates (lactate, pyruvate, acetate) a rather large discrepancy appears between results in the two types of studies. With glucose, moderate variation in the incubation temperature, atmospheric composition, and pH of the medium had no appreciable effect on assimilatory efficiency. Complete removal of CO<sub>2</sub> decreased synthesis, as did high concentrations of oxygen. With very high partial pressures of O<sub>2</sub> no growth occurred, though no effect of such atmospheres could be observed on the behavior of the resting cell suspensions. An insufficiency of N did not materially affect the percentage of synthesis over a limited period of time, although it brought about a striking alteration in the composition of the organisms. An insufficiency of Fe in the medium resulted in a decreased synthesis—particularly striking with those substrates utilized more rapidly than glucose. Pyruvic acid accumulated in Fe-deficient media with sucrose and trehalose, but not with other substrates studied as C sources.

**Conversion of desthiobiotin into biotin or biotinlike substances by some microorganisms,** L. H. LEONIAN and V. G. LILLY. (W. Va. Expt. Sta.). (*Jour. Bact.*, 49 (1945), No. 3, pp. 291-297).—Twelve yeasts and four filamentous fungi grown on desthiobiotin converted it into biotin or vitamers of biotin active for the following organisms unable to utilize desthiobiotin: *Lactobacillus arabinosus*, *L. casei*, *Rhizobium trifolii* 205, and *Sordaria fimicola*. Quantitative determinations failed to recover all the biotin activity from the following organisms grown on known amounts of biotin: *S. fimicola*, *Saccharomyces cerevisiae* "old process," *Neurospora sitophila*, and *Ceratostomella pini*. The amount of biotin activity recovered depended on the organism assayed and the test organism used. When these organisms were grown in the presence of 1,000 µg. of desthiobiotin in addition to biotin, *S. cerevisiae* old process was found to convert desthiobiotin into substances having biotin activity for *L. arabinosus* and *L. casei*, but not for *R. trifolii* 205, whereas *N. sitophila* converted desthiobiotin into vitamers of biotin active for the former two test organisms and for *R. trifolii* 205 as well. No evidence of conversion of desthiobiotin into biotin vitamers active for *L. arabinosus*, *L. casei*, and *R. trifolii* 205 by *S. fimicola* and *C. pini* was found. The mycelium of *S. fimicola* stored large amounts of desthiobiotin; that of *C. pini* did not.

**Phytohormonal activity of soil bacteria,** N. A. KRASSILNIKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 45 (1944), No. 2, pp. 80-83, illus. 2).—"According to our observations, different bacterial species produce different growth substances in varying quantities. Bacterial strains of the *Pseudomonas* group are the richest in growth substances, after these comes the *Azotobacter*, the nonsporulating bacteria of the *Achromobacter* group, while these substances are almost entirely lacking in sporulating bacteria, mycobacteria, and mycococci." The bacteria tested are reported to have produced beneficial effects on higher plants by means of their metabolites, enhancing the growth and development and activating the life processes

of the cells. The author calls these complexes "activators" and feels "justified in considering these substances as hormones."

Observation of bacteriophage through a light microscope, A. W. HOFER and O. W. RICHARDS. (N. Y. State Expt. Sta. et al.). (*Science*, 101 (1945), No. 2627, pp. 466-468, illus. 1).—A preliminary report on the results with four different methods of observation.

The rôle of tryptophane in the adsorption of two bacterial viruses on their host, *E. coli*, T. F. ANDERSON (*Jour. Cell. and Compar. Physiol.*, 25 (1945), No. 1, pp. 17-26).—Three viruses (bacteriophages)  $T_2$ ,  $T_4$ , and  $T_6$ —similar morphologically and belonging to the same serological group—exhibited different activities on a common host *Escherichia coli* (strain B) in a synthetic medium containing sodium lactate as sole source of C and  $\text{NH}_4\text{Cl}$  as the sole source of N. When assayed,  $T_2$  suspensions gave as high titers (by plaque count) on the host in this medium as they did on nutrient agar, whereas  $T_4$  and  $T_6$  suspensions gave less than one-thousandth of the nutrient agar titer on synthetic medium. The activities of  $T_4$  and  $T_6$  were brought almost to normal by adding minute amounts of *l* tryptophan to the synthetic medium used for assay. Larger amounts of *dL* phenylalanine showed some activity in this respect, but none of a long list of other amino acids or growth substances was found to have marked activity at the concentrations used, nor were certain known metabolic precursors of tryptophan effective. Preliminary exposure of the virus alone to tryptophan failed to increase its activity on the host in the absence of tryptophan. Further studies indicated that tryptophan enhanced the activities of these two viruses by increasing their rates of adsorption on the host when the tryptophan was present in the adsorption mixture. A similar increase in adsorption on host cells killed by heat or ultraviolet light was effected by tryptophan. Once a virus particle is adsorbed on a living host cell it appears to be able to give rise to a normal virus plaque on a bacterial smear even in the absence of added tryptophan. The significance of the findings is discussed.

On a bacteriolytic substance associated with a purified bacterial virus, T. F. ANDERSON (*Jour. Cell. and Compar. Physiol.*, 25 (1945), No. 1, pp. 1-15, illus. 9).—Cells of *Escherichia coli* (strain B) that had been heavily irradiated with ultraviolet light were rapidly lysed by centrifugally purified preparations of the virus (bacteriophage)  $T_2$  without multiplication of the latter. This lytic activity was not destroyed by disintegration of the virus mechanically (sonic vibration) or photochemically (ultraviolet irradiation); in fact, the irradiation liberated a lysin from the heavy virus particles which was not sedimentable at 32,000 r. p. m. for an hour. The virus  $T_4$ —serologically and morphologically related to  $T_2$ —was not effective in lysing such irradiated cells unless a cofactor such as tryptophan was present in the mixture to enhance its rate of adsorption on the host. Taken together, these results may be assumed to indicate that a lysin can be dissociated from the virus  $T_2$  which remains active even after it has been separated from other elements of the structurally complex virus particle. This lysin was not inactivated by  $\text{AsO}_4^{3-}$ ,  $\text{N}_3^-$ , or by  $\text{SO}_4^{2-}$ . It was inactivated by 0.00001N I<sub>s</sub> but not reactivated by added  $\text{SO}_4^{2-}$ . The bacteriolytic enzyme from egg white—lysozyme—also lysed irradiated cells of this strain of *E. coli* with about the same activity exhibited in the classical test organism *Micrococcus lysodeikticus*, but the virus lysin exhibited greater specificity, having no visible effect on the latter organism. There are 25 references.

The germicidal properties of certain quaternary ammonium salts with special reference to cetyl-trimethyl-ammonium bromide, J. C. HOGERHEIDE (*Jour. Bact.*, 49 (1945), No. 3, pp. 277-289, illus. 5).—In a study of the bactericidal and bacteriostatic properties of the homologous series of quaternary ammonium salts derived from tetramethyl ammonium bromide, bactericidal properties became evi-

dent when one methyl group was replaced by a nonyl group. Further increase in chain length produced compounds of high germicidal potency with a definite maximum for cetyl-trimethyl-ammonium bromide. The effect of pH, temperature, and the inhibitory effect of serum on the bactericidal and bacteriostatic properties of this compound was studied in more detail. Its bactericidal potency increased considerably with increasing pH; at pH 8.0 its phenol coefficient for *Staphylococcus aureus* at 37° C. was found to be 1,200; when added to nutrient broth, 3 µg. per cubic centimeter prevented growth of *S. aureus*. Gram-positive and gram-negative species were equally affected. In the presence of serum a considerable part of the germicidal potency was lost. Comparison of its potency with that of a series of commonly used disinfectants showed that this compound is one of the outstanding bactericidal and bacteriostatic agents.

**Microbial antagonisms and antibiotic substances**, S. A. WAKSMAN. (N. J. Expt. Sta.). (London: Oxford Univ. Press; New York: Commonwealth Fund, 1945, pp. 350+, illus. 35).—Between true parasitism and true saprophytism are groups of relationships that may be designated as antagonistic and associative. In the pages of this monograph "an attempt is made to present the broad interrelationships among micro-organisms living in association, either in simple mixed cultures or in complex natural populations, with special attention to the antagonistic effects. . . . The chemical nature of the active—antibiotic—substances produced by various antagonists is described, and the nature of the antagonistic action as well as its utilization for practical purposes of disease control is discussed." Because more detailed studies have been made on the production, nature, and utilization of penicillin, more information is presented about this than about any of the other substances; this is not to be construed, however, "as desire on the author's part to emphasize this substance." The discussion revolves around soils and water basins as habitats for micro-organisms; human and animal wastes; interrelationships among micro-organisms in mixed populations; isolation and cultivation of antagonistic micro-organisms and methods of measuring antibiotic action; bacteria, actinomycetes, fungi, and microscopic animal forms as antagonists; antagonistic relationships among micro-organisms, viruses, and other nonspecific pathogenic forms; chemical nature of antibiotic substances; nature of antibiotic action; utilization of antagonistic micro-organisms and antibiotic substances for disease control; microbiological control of soil-borne plant diseases; and the outlook for the future. Final sections include a classification of antibiotic substances, a glossary, a bibliography (1,016 references), an index of micro-organisms, and a general subject index.

**Some effects of induced streptothricin resistance on *Lactobacillus casei***, D. PERLMAN and E. McCoy. (Wis. Expt. Sta.). (*Jour. Bact.*, 49 (1945), No. 3, pp. 271-275).—Streptothricin-resistant strains of *L. casei* (A. T. C. C. 7469) were compared with the streptothricin-susceptible parent strain. Differences in the pantothenic acid and biotin sensitivity, as well as in growth at various temperatures, were observed between the susceptible parent strain and the resistant strains. These differences were apparently permanent under the experimental conditions.

**Penicillin as a sporicidal agent**, H. R. CURRAN and F. R. EVANS. (U. S. D. A.). (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 3, pp. 262-265).—Under suitable conditions of incubation, penicillin in relatively low concentrations proved actively sporicidal to many aerobic species of bacteria. In sensitive species this activity was much greater in milk than in water and was usually enhanced by sublethal heating of the spores before treatment with penicillin.

**The effect of penicillin and certain sulfa drugs on the intracellular bacteroids of the cockroach**, C. T. BRUES and R. C. DUNN (*Science*, 101 (1945), No. 2622, pp. 336-337).—From experimental data presented, it is apparent that administra-

tion of penicillin at the lower concentrations used very greatly reduced the number of bacteroids, but after the cockroaches (*Blaberus craniifer*) were allowed to live normally for a time these bacteroids gradually increased in numbers; meanwhile the roaches exhibited no ill effects. When, however, sufficient penicillin was administered to destroy the bacteroids or to reduce their numbers to a very low level, the roaches finally died after some days. Since they did not succumb at once, it is believed their death could not be attributed to the direct toxic action of the penicillin, but rather to a lack of something supplied by the bacteroids. It thus appears that the bacteroids may be symbiotic—not parasitic—micro-organisms.

**Increasing penicillin yields with corn oil.** D. F. HOLTMAN. (Univ. Tenn.). (*Jour. Bact.*, 49 (1945), No. 3, pp. 313-314).—Corn oil at 2 percent in Czapek-Dox medium modified by substituting brown sugar for glucose was found not only to float the spores but also to permit the ready development of an abundant and uniformly distributed mold growth.

**New strains of *Penicillium notatum* induced by bombardment with neutrons.** W. G. MYERS and H. J. HANSON. (Ohio State Univ.). (*Science*, 101 (1945), No. 2623, pp. 357-358).—A preliminary report.

**Investigations into causes and control of moulds in state houses.** R. M. BRIEN and R. W. DENNE (*New Zeal. Jour. Sci. and Technol.*, 26 (1945), No. 4, Sect. B, pp. 174-181, illus. 8).—During recent years a black discoloration on plasterboard ceilings and blue-green or yellowish molds on wallpapered surfaces have been observed, in many instances within 2 yr. after construction. Preliminary investigations indicated these discolorations to be due to certain common molds—*Cladosporium herbarium*, *Penicillium commune* P. *chrysogenum*, and *Aspergillus versicolor*. These molds were not found to develop on untreated plasterboard, but grew readily on this material when it was coated with glue size, flour paste, etc. Further studies showed that such development may be prevented provided a 2 percent concentration of sodium pentachlorophenate is added to the treating material.

**The existence of physiological strains in *Physarum polycephalum*.** W. D. GRAY (*Amer. Jour. Bot.*, 32 (1945), No. 3, pp. 157-160).—Small plasmodial strands from eight cultures were paired in all possible combinations; fusion occurred consistently in some, never in others. Plasmodia from the same original source but maintained in different laboratories by different investigators for several years retained their capacity to fuse. Some evidence was found of the existence of geographical strains in this myxomycete species; there was no evidence of the prevention of fusion by the formation of exotoxins.

**Minnesota species of *Aleurodiscus*.** H. E. STORK (*Minn. Acad. Sci. Proc.*, 11 (1943), pp. 32-34).—A brief account of the species of this fungus genus (Basidiomycetes) in Minnesota.

**Notes on the culture of *Coprinus asterophorus*.** H. L. BARNETT. (N. Mex. Col. Agr.). (*Mycologia*, 37 (1945), No. 2, pp. 194-196, illus. 7).—This fungus was found to be homothallic, producing clamp connections and typically binucleate oidia which germinate to produce typical mycelium with multinucleate or binucleate cells.

**Marine algae of the Monterey Peninsula, California.** G. M. SMITH (*Stanford University, Calif.: Stanford Univ. Press; London: Oxford Univ. Press, 1944*, pp. 622+, illus. 98).—Although limited to a very small geographical range, this manual is said to describe a large majority of the seaweeds along the western coast of the United States. Numerous identification keys, a glossary, and a subject index are included.

**Vascular plants collected on Kiska and Great Sitkin Islands in the Aleutians by Lt. H. R. McCarthy and Cpl. N. Kellas, August, September, and October 1943.** A. E. PORSILD (*Canad. Field Nat.*, 58 (1944), No. 4, pp. 130-131).—An annotated list.

Check list and index to the Cyperaceae of Monroe County, New York, R. H. GOODWIN (*Rochester: Author, 1943, pp. 20-4*).—

Growth stimulation by manganese sulphate, indole-3-acetic acid, and colchicine in the seed germination and early growth of several cultivated plants, T.-L. LOO and Y.-W. TANG (*Amer. Jour. Bot.*, 32 (1945), No. 3, pp. 106-114).—The rate of seed germination of mungo bean, corn, and cabbage was accelerated by  $MnSO_4$  in a wide range of concentrations; in corn, a considerable increase in both length and dry weight was secured in the presence of  $10^{-3}$  and  $10^{-4}$  M. The growth habit of seedlings in these solutions was perfectly normal. High concentrations of indole-3-acetic acid inhibited the rate of germination and growth; low concentrations gave as good as or slightly better results than in the control. This acid stimulated production of adventitious roots; these, however, were thick and short with prominent swellings at their tips. Colchicine in appropriate concentrations stimulated seed germination and caused slight increases in growth; high concentrations were growth-inhibitory. Roots grown in this solution appeared quite normal. Pretreatment of rice and wheat seed with  $MnSO_4$  in suitable concentration had a favorable aftereffect on seed germination and growth of plants, provided the time of treatment was not longer than 24 hr.; soaking of the seed for longer periods proved unfavorable for subsequent development even in redistilled water. Soaking the seed with indole-3-acetic acid depressed the germination rate, but on transferring the seed to water, elongation of the root was accelerated at the expense of the shoot; longer treatment retarded the elongation of both root and shoot, and swelling of root tips was also observed. The aftereffect of seed-soaking with colchicine on seed germination was fairly good, but the subsequent development of the treated seed was unfavorable. There are 47 references.

The fluorescence of frozen potato tuber and apple fruit tissue under ultraviolet light, W. NEWTON and W. JONES (*Canad. Jour. Res.*, 23 (1945), No. 2, Sect. C, pp. 76-78).—Freshly cut sections of frozen potato tuber and apple fruit exhibited a brilliant fluorescence when examined in a dark room under an ultraviolet (Strobile) lamp. This fluorescence disappeared from the apple on thawing, but was retained by the potato tuber tissue. Thus the ultraviolet lamp serves as a useful means of detecting frost or low temperature injury in potato tubers. Many other plant tissues were frozen and examined, but none proved to be fluorescent. Acetone extracts of both normal and frozen potato tuber tissue were fluorescent; similar extracts of frozen and normal apple fruit were not. Although frozen potato tissue was brightly fluorescent and normal tissue was not, no differences were found in the brightness of their acetone extracts.

La culture des tissus et des organes végétaux, P. NOBÉCOURT (*Rev. Sci. [Paris]*, 81 (1943), No. 4, pp. 161-170, illus. 7).—A review of tissue culture technic as applied to plants, with copious bibliography.

Elasticity of plant tissues, O. TREITEL (*Kans. Acad. Sci. Trans.*, 47 (1944), No. 2, pp. 219-239, illus. 12).—This study is an attempt to determine whether there are general laws of behavior for all elastic plant and animal tissues, and whether the elastic tissues of *Equisetum* rhizomes are found in all elastic living tissues. Many experiments show that there are relations of growth and stress. These relations are still more obvious because stress-strain curves for living tissues and growth curves of animals and plants are both S-shaped. The equations of both kinds of curves are very similar. In addition, the velocity of an autocatalytic reaction also follows an equation similar to that of the growth curve. Hence it is concluded that growth is a biological phenomenon whose physical part may be explained by using stress and whose chemical part may be explained by using autocatalytic reactions. Detailed graphs and formulas, with discussion, are presented.

The calculation of tensions in *Cucurbita pepo*, C. R. STOCKING (*Amer. Jour. Bot.*, 32 (1945), No. 3, pp. 126-134, illus. 6).—The new method described for cal-

culating tensions in the xylem of intact squash plants during normal growth and wilting involves the observation via a refractometer of changes in the concentration of pure sugar solutions injected into the hollow petioles of the leaves. Diurnal fluctuations were observed in the diffusion pressure deficits of the solutions injected into plants growing in the soil and reflected changes in probable tensions of from 4 atmospheres during a warm summer day to positive pressures of over 1 atmosphere during the night. Increasing tensions associated with wilting reached 6.3 to 9.1 atmospheres in squash growing in soil at about the wilting percentage. The greater water absorbing power of young leaves could not be correlated with the average osmotic pressure of the sap expressed from the leaves; it is suggested that imbibitional forces may be dominant in this case. There are 32 references.

The influence of H-ion concentration on the mineral composition of *Chlorella pyrenoidosa*, G. T. SCOTT (*Jour. Cell. and Compar. Physiol.*, 25 (1945), No. 1, pp. 37-44, illus. 1).—The physiological properties of cells are influenced by the H-ion concentration of the surrounding medium; the nature of this external environment may be an important factor in determining the pH of the cell contents. Cells of this alga were resuspended in solutions of varying pH-containing salts of either potassium or sodium phosphate which acted as buffers. When the pH of these washing solutions was alkaline there was an increase of the K or Na content of the cells; in buffered solutions of acid pH there was a loss of total base from the cell. At high pH, Na was accumulated by the cells when there was no K in the culture medium. After adding a definite amount of alkali to Dettmer's medium the amount of Ca, Mg, and K in the cell increased; after adding acid to the medium the amount of Ca and K in the cells decreased. An increase of pH in the medium augmented the base-binding capacity of organic constituents within the cell. At a low pH of the medium some phosphate together with total base was lost from the cell. This is assumed to be due to the instability in an acid medium of certain phosphate-containing compounds in the cell and to a decrease in the base-binding capacity of constituents within the cell. *Chlorella* cells displayed buffering action against added acid or base to the medium. The titration curve was in general like that of proteins.

Differing rates of death at inner and outer surfaces of the protoplasm.—III, Effects of mercuric chloride on *Nitella*, W. J. V. OSTERHOUT (*Jour. Gen. Physiol.*, 28 (1945), No. 4, pp. 343-347, illus. 2).—In continuation (E. S. R., 92, p. 188), it was found that the inner and outer protoplasmic surfaces in *Nitella* may differ greatly in behavior. When 0.01 M  $HgCl_2$  is applied externally, death arrives first at the inner surface; but when 0.01 M  $HgCl_2 + 0.01$  M KCl is applied, death occurs sooner at the outer surface. Since 0.01 M KCl by itself is not toxic, its effect may be to condition the surface layer chemically or by means of the diffusion potential it sets up—this may amount to 100 mv. These surfaces consist of non-aqueous films forming the boundaries of a layer of aqueous protoplasm not over  $10\mu$  thick. These and earlier studies with formaldehyde and with chloroform show clearly that it is possible to control the behavior of the protoplasmic surfaces so that when a toxic agent is applied it may produce death more rapidly at the inner or at the outer surface, according to experimental conditions.

The use of the C<sup>14</sup> isotope as a tracer in transport problems in plants, G. S. RABIDEAU and G. O. BURR. (Univ. Minn.). (*Minn. Acad. Sci. Proc.*, 11 (1943), pp. 44-45).—An abstract.

The proteins of plants, H. B. VICKERY. (Conn. [New Haven] Expt. Sta.). (*Physiol. Rev.*, 25 (1945), No. 2, pp. 347-376).—This critical review (85 references) is presented from the viewpoint of a protein chemist interested in proteins as chemical substances; emphasis is thus placed on the problem of their differentiation and purification in the hope that—when sufficient has been learned about them—

adequate chemical and physical characterizations can be made. Only when this has been done for these components of the systems that carry out the functions of the living cell can it be learned what these functions really are. The author's purpose will have been fulfilled "if better definition has been given to the concept plant protein, and if a little light has been shed upon the position of our present knowledge of these substances."

**Photosynthesis and growth-processes in beet** (*Beta vulgaris* L.), A. A. RICHTER, K. T. SUKHOUKOV and L. A. OSTAPENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 45 (1944), No. 6, pp. 258-260).—From his study of the relations between processes taking place in the green plastid and those going on in the surrounding protoplasm—using *B. vulgaris* subsp. *esculenta* and *altissima* as test plants—the author concludes that there is no direct relation between growth, accumulation of matter, and photosynthesis. In both plants investigated the primary stage of photosynthesis is said to pass independently, without functional correlation with growth, accumulation of matter, or decomposition of CO<sub>2</sub>. The rate of CO<sub>2</sub> decomposition per unit area was about the same in plants differing sharply in the development of their organs and in their rates of growth.

**The quantum yield of oxygen production by chloroplasts suspended in solutions containing ferric oxalate**, C. S. FRENCH and G. S. RABIDEAU. (Univ. Minn.). (*Jour. Gen. Physiol.*, 28 (1945), No. 4, pp. 329-342, illus. 4).—The quantum yield of O<sub>2</sub> liberation by spinach and *Tradescantia* chloroplasts suspended in solutions containing ferric oxalate and potassium ferricyanide varied from 0.013 to 0.080. It is concluded that the nature of this O<sub>2</sub> liberation reaction does not differ fundamentally from the formation of O<sub>2</sub> in normal photosynthesis, with respect to its light efficiency.

**A contribution to the problem of photoperiodism physiology**, A. I. POTA-PENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 45 (1944), No. 2, pp. 84-85).—Based on experiments with *Bidens tripartitus*, the author presents a hypothesis to account for the mechanism of the photoperiodic reaction, from which he concludes that the processes leading to the production of photoperiodic impulses have no direct relation to photosynthesis, but that they may subsequently affect the course of photosynthesis as well as the properties of the assimilates.

**A note on the interaction between heterosis and photoperiodic response**, B. HOROWITZ (*Austral. Jour. Sci.*, 7 (1945), No. 4, pp. 126-127).—A note on observations by the author on *Nicotiana rustica* leading to the assumption that heterosis can—under varying light conditions of growth—be influenced to a large extent by the photoperiodic reaction of the parents and their progeny in the first generation.

**Fotoperiodicidad en "Baeria chrysostoma"** [Photoperiodism in branched goldfields], E. M. SIVORI and F. W. WENT (*Rev. Argentina Agron.*, 11 (1944), No. 4, pp. 265-277, illus. 12).

**The structure of the cell walls of *Aspergillus* and the theory of cellulose particles**, E. S. CASTLE (*Amer. Jour. Bot.*, 32 (1945), No. 3, pp. 148-151).—Both the primary wall at the growing tip of the conidiophore of *Aspergillus* and the older and thicker secondary wall were found to have a coherent fine-textured structural skeleton of chitin. There was no tenable evidence that the walls contain cellulose, or that identifiable particles of cellulose or of chitin exist in the cytoplasm. At the growing tip the entire cell wall was less than 0.5μ in thickness and could not be constituted of particles 1μ or more in diameter. Theories of cell wall formation by the deposition of visible cytoplasmic particles of cellulose are not supported by these findings.

**The cytoplasmic basis of intercellular patterns in vascular differentiation**, E. W. SINNOTT and R. BLOCH (*Amer. Jour. Bot.*, 32 (1945), No. 3, pp. 151-156, illus. 10).—In young internodes of *Coleus* not yet fully grown, regeneration of

vascular strands across parenchymatous pith tissue was induced by severing one or more large vascular bundles. The new bundle connections included both xylem and phloem strands; the former consisted in part of elongate tracheids and vessels formed by procambial divisions parallel to the course of the new strands, and in part of vacuolate and nearly mature parenchyma cells—essentially isodiametric in outline—which had differentiated directly into spiral or reticulate xylem elements without division. Although the original elongation axes of the pith cells were parallel to the internode axis, both the new divisions therein and the configuration of the lignified bands and of the pores in the undivided cells had a definite orientation relative to the axis of the new strand. This reorientation was first evident in the cytoplasm, since the position of the new walls was preceded by a cytoplasmic diaphragm and since the position where each lignified band would later be deposited was occupied in early differentiation by a band of densely granular cytoplasm. This cytoplasmic pattern of bands and its final manifestation in the lignified thickenings were not independent phenomena in each cell, but formed a harmonious pattern over a group of cells, the elements of the pattern in one cell being directly continuous with those in adjacent ones. The evidence suggests that histological differentiation—both normally and in regeneration—involves the establishment of such intercellular patterns or fields in the cytoplasm of groups of contiguous cells.

Growth and vascular development in the shoot apex of *Sequoia sempervirens* (Lamb.) Endl.—I, Structure and growth of the shoot apex, C. STERLING. (Univ. Calif.). (*Amer. Jour. Bot.*, 32 (1945), No. 3, pp. 118–126, illus. 10).—This histological study is illustrated by photomicrographs and a diagram.

Leaf and bud initiation in the Gramineae, B. C. SHARMAN (*Bot. Gaz.*, 106 (1945), No. 3, pp. 269–289, illus. 9).—“In spite of the widespread distribution and the economic importance of the order, there appears to have been very little investigation of the mode of initiation of the leaf and bud in the Gramineae. What little literature there is fails to give an exact picture of the earliest stages. It is hoped that the present study may elucidate some of the more salient features.” There are 25 references.

Las yemas adventicias o “agallas” de la caña [Adventitious buds or “galls” on sugarcane stalks], G. L. FAWCETT (*Rev. Indus. y Agr. Tucumán*, 34 (1944), No. 1–3, pp. 20–22, illus. 2).

Conditions of formation, development, and differentiation of a callus, W. O. TAUSSON (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 45 (1944), No. 5, pp. 213–216, illus. 1).—This study led to the following conclusions: The formation and differentiation of a callus from cambium in the native Russian rubber plants (krym-saghyz, kok-saghyz, and tau-saghyz) requires a heightened gas exchange; cutting of a root—resulting in such an increase locally—stimulated callus development at the incision points. Under maximum aeration a differentiation of the callus into leaves soon set in, thereby slowing down the growth of the callus and finally arresting it altogether. At an intermediate gas exchange the callus preserved its meristematic activity indefinitely, forming tumorlike structures. Tumors developing under reduced gas exchange are of the nature of a malignant growth, preserving for an indefinite period properties characteristic of embryonic tissues. Differentiation of the callus into roots also depends largely on the gas exchange conditions. The various processes investigated were controlled by duly modifying these conditions; the results are considered as confirmatory of the author's theory of the “exothermic nature of biological syntheses.”

Induced parthenocarpy in *Ginkgo*, E. H. NEWCOMER (*Amer. Nat.*, 79 (1945), No. 781, pp. 186–187).—The author reports that in none of the gymnosperms pollinated with a variety of foreign pollens over a 4-yr. period has there resulted a single case of parthenocarpy save in *Ginkgo*, and in this case after application of pollen from *Cedrus deodara*. In view of the genetic and morphological gaps

between *Ginkgo* and *Cedrus* it is believed safe to assume that syngamy was not involved and that pseudogamy was certainly indicated.

*Anomalías florales en "Petunia axillaris" y en "Solanum bonariense"* [Floral anomalies in *P. axillaris* and *S. bonariense*], R. MARTÍNEZ CROVETTO (*Rev. Argentina Agron.*, 11 (1944), No. 4, pp. 294-301, illus. 2).

Anatomy of *Cryptostegia grandiflora* with special reference to the latex system, H. W. BLASER. (*Cornell Univ. Amer. Jour. Bot.*, 32 (1945), No. 3 pp. 135-141, illus. 36).—Latex tubes of the unarticulated type form a branching system in the embryo; they are extra-vascular and enter the pith above the cotyledons by way of the cotyledonary gap. In the young stems, latex tubes cross the stele frequently, but most of the connections between cortex and pith occur at the gap regions. A single large leaf trace and the branch traces form a common gap which remains open for at least 2 yr. The tips of these tubes extend close to the surface of apical and axillary meristems which are identical in size and structure. The leaves—of mesophytic type—contain latex tubes on both surfaces of the netted veins. Branches occur in conjunction with vein-branching; other branch tubes extend into the mesophyll in all directions. Some reach the epidermis and extend some distance along the inner surface of the epidermal cells. A periderm arises in the subepidermal layer of the fifth or sixth internode. This first periderm persists for at least 2 yr., forming rather few cells. Secondary growth of the vascular cylinder imbeds the primary latex tubes which cross the stele; no secondary tubes are formed. Growth for 2 yr. is accompanied by elongation of the original latex tubes. The cortex maintains itself by continued cell division of the parenchyma cells. This meristematic activity invites a reevaluation of some of the "modern" uses of the term meristem. Pericyclic fibers which are external to the phloem and not associated with the sieve tubes call attention to recent suggestions that all extra-xylary fibers be called "bast-fibers." The author objects to this term and suggests that "pericyclic region" is of anatomical value where a question of the validity of the term "pericycle" exists.

Modified anatomical structure in kok-saghyz roots and its biological import, S. W. BULGAKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 45 (1944), No. 1, pp. 35-38, illus. 3).—Certain pronounced morphological variations in the root structure of kok-saghyz are described as follows: During the first year separate foci of cambium producing independent vascular bundles and a bark containing laticiferous vessels are formed in the secondary bark. The total increase in cambial tissue insures a rapid growth of the bark of the root as a whole. A corresponding increase in the number of laticiferous vessels and a close packing of the latter secure a high rubber content in the root tip, irrespective of its thickness. A distinctive external feature of this phase of growth in the root lies in its slightly ribbed surface and the frequently pronounced and sharply tapering shape of the root. According to environmental conditions, either by the second or third year some of the plants show further differentiation and disintegration of the root tissues. In moist fertile soils rich in organic matter, cork tissue is formed inside the root around each separate pith-bark system. The common sheath investing the root finally bursts, the bark parenchyma between the new formations dies away, and the latter emerge as separate roots, each bearing a rosette of leaves. There is here a peculiar method of vegetative propagation of kok-saghyz whereby a mother plant is transformed after a certain period of time into a group of independent plants, i. e., a natural clone. The practical implications of these findings are discussed as related to breeding and selection.

Some staining techniques for guayule studies, F. W. HAASIS. (U. S. D. A.). (*Stain Technol.*, 20 (1945), No. 2, pp. 37-44).—For staining tissues and secretions of guayule the following dyes and dye combinations are reported to have proved satisfactory: Rubber in plant sections, Sudan IV; plant sections (rubber and tissues)

and ground tissues, Poirrier's blue, Sudan IV, and titan yellow; rubber extraction films (with tissue contamination), oil blue NA, safranin O, and titan yellow; resin extraction films, Bismark brown and oil blue NA; and chopped plants (milling studies) safranin O and Sudan IV. For microscopic studies, sections and ground tissues are pretreated with KOH and a bleaching agent prior to staining.

## GENETICS

Shall we lose or keep our plant and animal stocks, W. LANDAUER. (Univ. Conn.). (*Science*, 101 (1945), No. 2629, pp. 497-499).—It is deemed to be in the interest of society, agriculture, and industry that any stock be preserved which may have future usefulness, especially in postwar conditions and in the solution of various problems that may arise.

The relation of sporulation and the range of variation of the haplophase to populational adaptation, S. SPIEGELMAN and C. C. LINDEGREN (*Jour. Bact.*, 49 (1945), No. 3, pp. 257-269, illus. 5).—*Schizosaccharomyces pombe*, previously reported as unadaptable, was adapted to galactose fermentation by inoculating with heavily sporulating cultures into 2 percent glucose-8 percent galactose mixtures. The same methods failed with both *S. octosporus* and *Saccharomyces ludwigii*. These results are interpreted in terms of the genetic instability of the haplophase and its suppression by rapid copulation in the last two strains. Unadaptable haploid strains were isolated from adaptable parents; the significance of this for an understanding of the range of biochemical variation of mutant types is discussed.

Linkage relations of factors for resistance to mildew in barley, F. N. BRIGGS. (Univ. Calif.). (*Genetics*, 30 (1945), No. 2, pp. 115-118).—From a cross between Psaknon, which carries the Psaknon factor *Ml*<sub>1</sub> for resistance to powdery mildew (*Erysiphe graminis*) and Selection 175, which is a selection from Duplex X Atlas and carries the Duplex factor *ml*<sub>4</sub> for resistance to this disease, it was found that these two genes for resistance are linked with a recombination value of 16.38 percent. These genes were linked with the factor pair normal v. albinus (*At at*), which places them in linkage group II. The cross-over percentages were 12.08 for the Duplex and 36.65 for the Psaknon genes, respectively. The gene order indicated was *at, ml*<sub>4</sub>, *Ml*<sub>1</sub>.

Studies on colchicine-induced autotetraploid barley.—I, II, Cytological and morphological observations, S.-L. CHEN, S.-M. SHEN, and P. S. TANG (*Amer. Jour. Bot.*, 32 (1945), No. 3, pp. 103-106, illus. 9).—Autotetraploid plants were induced by the use of colchicine and have been maintained since 1939. Cytological observations showed various irregularities in chromosome configuration, but in a few lines regular bivalents were formed from which stable strains may be isolated in the future. The findings from statistical treatment of morphological characters of agronomic interest were in line with results by other workers on other polyploid plants. The fertility of the *4n* plants as a whole was lower than that of the diploids.

The cause of incompatibility between barley and rye, W. P. THOMPSON and D. JOHNSTON (*Canad. Jour. Res.*, 23 (1945), No. 1, pp. 1-15, illus. 22).—When common barley is pollinated by common rye, fertilization takes place normally but no viable seeds are produced. Studies in which Regal barley was the main female parent and Prolific rye furnished the pollen showed the immediate cause of the failure to be abnormal development of the hybrid endosperm and particularly of the endospermic nuclei, which from an early stage are of immense size and always few in number. No cells are formed in the endosperm, which collapses on the fifth or sixth day after pollination and disintegrates. The hybrid embryo, although it grows more slowly than the pure barley embryo from the third day, appears normal and healthy long after the endosperm has become very abnormal or has

collapsed completely. Behaviour of maternal tissues of crossed material is similar to that of selfed material, and rules out the theory of somatoplasic incompatibility. Behaviour of antipodal cells of the embryo sac does not differ enough from normal to be of significance.

**Helminthosporium turcicum leaf blight on corn inbred lines and crosses in 1944 following artificial inoculation**, M. T. JENKINS and C. ELLIOTT (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin.*, 1945, pp. 15).—The severe losses in grain yield and forage value in many corn hybrids in 1942 from *H. turcicum* infection emphasized the importance of breeding for resistance. As a preliminary to more intensive concentration on this work, seed of a number of inbred lines and single and double crosses was collected, planted in 1944, and subjected to inoculation approximately twice a week from June 23 to July 24, when many of the plants were showing tassels. Most of the inbred lines and hybrids of Corn Belt maturity proved extremely susceptible under the experimental conditions, and only slightly less so for the later-maturing lines and hybrids. All 36 of 200 inbred lines and all but 14 of 184 double crosses became heavily infected by mid-September. One outstanding line (NC34) was significantly more resistant than any other line tested; 10 other lines had only slight to moderate infection. Among the single crosses, one (K155) averaged more resistant than those of any other parent line in the midseason or late yellow uniform tests; those involving another (Mo22) averaged appreciably more resistant than any other parent line in the late white uniform test, and those involving T61 averaged more resistant than those of any other parent line in the southern white uniform test. The differences among parent lines in the southern yellow uniform test were small, but the crosses involving two (Kys and K4) averaged more resistant.

**On the genetic control of mutability in maize**, M. M. RHOADES (*Natl. Acad. Sci. Proc.*, 31 (1945), No. 3, pp. 91-95).—The data presented indicate that the *Dt* allele, which profoundly affects the mutability of the recessive *a* allele, is located at the end of the short arm of chromosome 9. The regional distribution of crossing-over in the short arm of this chromosome and the location of the known mutant genes therein are considered. Examination of the published information on the genetic control of the mutation rate of the recessive *a* allele reveals that it cannot be accounted for in terms of factor interaction, epistasis, and threshold values.

**Natural breeding structure in the *Bromus carinatus* complex as determined by population analyses**, J. R. HARLAN. (Univ. Calif. and U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 3, pp. 142-148).—A total of 232 families taken from as many individual wild plants were analyzed for evidence of variation within a local race and for inbreeding between races. Plants within a family were generally extremely uniform, indicating a high degree of homozygosity for individual wild plants. Differences between families of the same local race showed that a given race is not genotypically uniform. Some families clearly exhibited segregation indicative of interracial hybridization. A hypothesis for the natural breeding structure in this grass is presented, involving the habit of facultative cleistogamy and explaining the existence of swarms of local races. Self-pollination is the rule, but highly heterozygous interracial hybrids occur occasionally in chasmogamous panicles. Through selfing this heterozygosity is rapidly reduced, and in a few generations one to several new recombinations of the original characters become established as new uniform races restricted in genetic variability.

**Obtención de plantas tetraploidoides de *N. rusticá* y *N. tabacum* mediante la colchicina**, E. ALCARAZ MIRA and A. IZQUIERDO TAMAYO ([Spain] *Bol. Inst. Nac. Invest. Agron.* No. 11 (1944), pp. 49-87, illus. 26; Fr., Ger., Eng. abs., pp. 84-85).—Tetraploid plants of *Nicotiana rusticá*, variety Hemelowka, and of *N. tabacum*, variety Hybrid 196-A (Valencia X Round Tip), were obtained by soaking the seeds in 0.2 and 0.5 colchicine solutions. Their tetraploid characteristics were

verified by cytologic study and by counting the chromosomes, and their morphologic characteristics are now being investigated. Their fertility was checked in detail; it was low but sufficient to give larger and darker seeds than those of normal plants. These seeds have germinated and produced tetraploid plants with similar morphologic and cytologic characteristics and of low fertility, as conditioned by formation of abnormal chromosomal groups. The tetraploid descendants of *N. rustica* showed nicotine contents as much as 250 percent higher than diploid plants grown under similar conditions.

Cytological and genetical studies of the interspecific cross of the cultivated foxtail millet, *Setaria italica* (L.) Beauv., and the green foxtail millet, *S. viridis* L., H. W. and C. H. Li and W. K. Pao (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 1, pp. 32-54, illus. 4).—In continued improvement research with millets (E. S. R., 74, p. 629; 84, p. 27), a cross was made between *S. italica* and *S. viridis*, both with nine pairs of chromosomes. Pairing of chromosomes in  $F_1$  seemed normal although about 70 percent of the pollen was sterile. The  $F_1$  hybrid resembled *S. viridis* for all eight qualitative characters studied except pericarp color. The 15 gene differences with three linkage groups revealed in  $F_2$  were confirmed in  $F_3$ . *S. viridis* appeared to be the probable immediate progenitor of *S. italica*.

Genes found in this interspecific cross and character affected, respectively, *R*, *Vi*; *B* black seedcoat color, *R* and *Vi* complementary for tawny buff, *B* supplementary for black; *Y* yellow endosperm; *S*, *H* complementary for seed shattering; *Ps* prostrate seedling; *P* purple plant color; *In* intensifier of *P*; *Pr<sub>1</sub>*, *Pr<sub>2</sub>*, *Pr<sub>3</sub>* triplicate factors for purple bristle; *Br* brown anther color; *W* white pericarp color; and *Ga* gametophyte factor for differential pollen tube growth.

The linear order and crossover percentages in the three linkage groups are *In* 9.11 *Pr<sub>1</sub>* 20.93 *Pr<sub>3</sub>*; *B*, *Vi*, or *R* 19.37 *P* 27.09 *Pr<sub>3</sub>*; and *Ga* 36.8 *W* 12.32 *br.*. Other genes studied seem to be inherited independently of these three groups and of one another.

Cytological studies in the genus *Solanum*.—I, Wild and native cultivated "diploid" potatoes, H. C. CHOWDHURI (*Roy. Soc. Edinb. Trans.*, 61 (1942-43), pt. 1, No. 3, pp. 113-135+, illus. 242).

Cytological and genetical studies in the genus *Solanum*.—II, Wild and native cultivated "diploid" potatoes, H. C. CHOWDHURI (*Roy. Soc. Edinb. Trans.*, 61 (1942-44), pt. 1, No. 7, pp. 199-219+, illus. 69).

The production and characterization of ultraviolet-induced mutations in *Aspergillus terreus*, I, II. (U. S. D. A. et al.). (*Amer. Jour. Bot.*, 32 (1945), No. 3, pp. 160-165, illus. 4; pp. 165-176, illus. 4).

I. *Production of the mutations*, A. Hollaender, K. B. Raper, and R. D. Coghill.—A method for producing mutations in this fungus by ultraviolet irradiation is described. The probability of producing "deficient" mutants through chemical changes and the occasional appearance of mutants possessing increased ability to produce certain compounds is pointed out. Results are given on the percentage of mutation and survival after exposure to  $\lambda$  2,280, 2,650, and 2,967 a. u. The effect of secondary treatment after irradiation and the characteristic appearance of mutations after a relatively small number of spores have been killed are reported. There are 20 references.

II. *Cultural and morphological characteristics of the mutations*, K. B. Raper, R. D. Coghill, and A. Hollaender.—Random isolations were made from the colonies arising from conidia of a selected strain exposed to ultraviolet radiation. Approximately 200 of these were cultivated on a variety of agar media to determine the effect of the substrate on growth and attendant culture characters. The majority of isolates from irradiated spores—normally appearing and culture mutants alike—remained stable when recultivated on Czapek's solution agar. Eleven types

of mutations were recognized. One resulted from an inability of the mutant to produce thiamin; another was unable to utilize nitrate N but developed normally if supplied with NH<sub>3</sub> or amino N. In other cases mutations were more strictly morphological and consisted of a total or partial loss of color from the conidial heads with no apparent alteration in physiology. In still other and more numerous cases, both morphological and physiological changes were observed. Cultural and morphological differences reflected basic physiological or biochemical changes. Of the more than 200 isolates resulting from irradiated spores which were tested for production of itaconic acid, only 14 gave yields greater than the parent strain; among these only 2 appeared as culture mutants and 1 alone differed markedly from the parent strain. The production of ultraviolet-induced mutations appears to offer definite, if somewhat limited, possibilities of increasing the yields of itaconic acid from *A. terreus*.

**Genetics of *Glomerella*.—II, Fertilization between strains,** C. W. EDGERTON, S. J. P. CHILTON, and G. B. LUCAS. (La. State Univ.). (*Amer. Jour. Bot.*, 32 (1945), No. 3, pp. 115-118, illus. 1).—In continuation (E. S. R., 91, p. 529), two unlike strains of the plus and two of the minus types were obtained from a culture of *Glomerella* from *Ipomoea*. A ridge of perithecia formed rapidly on the line of contact when either plus strain was grown with either minus strain. From each cross, asci were obtained with four ascospores of the plus and four of the minus types used and others which contained eight ascospores of the minus type used. This indicates that a fertilization between the two strains occurs. A plus strain ordinarily seems to segregate into plus and minus. A strain of the plus type (plus B) was found, however, which failed to segregate in this way.

**Meiosis in autotetraploid *Lolium perenne* in relation to chromosomal behavior in autopolyploids,** W. M. MYERS. (U. S. D. A. et al.). (*Bot. Gaz.*, 106 (1945), No. 3, pp. 304-316, illus. 18).—Meiotic behavior was studied in pairs of diploid and tetraploid clones obtained by vegetative propagation from chimeral plants resulting from treatment of germinating seeds with colchicine solutions. As compared with the diploid clones, there was in the tetraploids a delay of chromosome contraction relative to the onset of metaphase I and in two clones absence of orderly orientation on the equatorial plate prior to initiation of anaphase I. In some pairs the chiasma frequency of the tetraploid clone was below that in the diploid, whereas in other pairs the differences were insignificant. There were three major types of meiotic irregularity in the tetraploid clones (described). Variations in meiotic behavior among the tetraploid clones were not significantly correlated with variations among the diploids. The frequencies of anaphase I sporocytes with dicentric bridges andacentric fragments in the tetraploid clones did not differ greatly from the frequencies calculated—assuming random pairing of inverted and normal chromosomes—from those obtained in the comparable diploid clones. There are 46 references.

**The inheritance of environmentally induced characters in bacteria,** J. M. SEVERENS and F. W. TANNER. (Univ. Ill.). (*Jour. Bact.*, 49 (1945), No. 4, pp. 383-393).—Single-cell cultures of *Salmonella pullorum*, *S. schottmüllerii*, and *Eberthella typhosa* were found able to adapt themselves to concentrations of NaCl, HgCl<sub>2</sub>, and CuSO<sub>4</sub>, considerably higher than those required to inhibit growth of nonadapted strains. The resistant strains were specific in their ability to overcome the growth-inhibiting properties of each chemical. Single cell cultures of resistant strains retained their resistance through long periods and through numerous transfers. Their permanency and specificity suggested a change in hereditary constitution. Experiments showed that populations of these bacteria contain a few individuals which possess the ability to withstand the action of the chemicals employed without previous contact with the chemical. In view of the hereditary

nature of the changes and their specificity it appears logical to classify them as mutations; the fact that they are found in small numbers in normal populations lends further support to this idea. It may be concluded that the adaptation of strains of bacteria to certain adverse environmental conditions probably consists of selecting from the population mutants possessing this resistant character, thus giving rise to a strain composed entirely of resistant individuals. There are 27 references.

**Livestock improvement in relation to heredity and environment**, J. E. NICHOLS (*Edinburgh and London: Oliver and Boyd, 1944, pp. 208+, illus. 24*).—General information on heredity and genetics and the influence of breeding systems and environment on type of livestock.

**Dominance modification and physiological effects of genes**, L. C. DUNN and S. GLUECKSOHN-SCHOENHEIMER (*Natl. Acad. Sci. Proc., 31 (1945), No. 2, pp. 82-84*).—In a series of experiments, it is shown that modifiers of the factor *Sd* (E. S. R., 84, p. 172) tend to make its urogenital effect recessive, but the same modifiers may increase the dominance of *Sd* in respect to tail length. Thus the evolutionary significance of factors affecting dominance can be properly assessed only when their physiological effects are known.

**The "why" and "how" of crossbreeding**, R. G. JAAP. (*Oklahoma Expt. Sta. Poultry Tribune, 51 (1945), No. 2, pp. 12, 36-39, illus. 5*).—Crossbreds are deemed more suitable for commercial broiler production than for laying flocks. Certain strains of poultry are more favorable than others. In crosses produced by Barred Rock  $\times$  Rhode Island Reds, there may be as much as  $\frac{1}{2}$  lb. difference at 12 weeks of age, depending on the strains from which the parents are chosen. The particular cross made is not as important as the particular strains within the breeds utilized for crossing.

**The influence of inbreeding upon the weight and size of dairy cattle**, S. MAR-GOLIN and J. W. BARTLETT. (*N. J. Expt. Stas. (Jour. Anim. Sci., 4 (1945), No. 1, pp. 3-12, illus. 6*).—Further study confirms the previous findings of the authors (E. S. R., 91, p. 530) that Holstein-Friesian cattle may be inbred without necessarily causing a decrease in body weight or body size from birth to maturity, provided Wright's inbreeding coefficient (E. S. R., 48, p. 468) does not exceed 0.20. Females with greater inbreeding coefficients than 0.20 developed normally to about the first calving age, but they showed abnormal development thereafter. However, such animals with complete growth records to 72 mo. of age do not vary significantly from the Ragsdale standard (E. S. R., 71, p. 688) in weight, height, and heart girth, although they are considerably smaller than outbred controls. Records serving the basis for the study were on the progeny of the Ormsby Sensation 45th family. Those inbred to a coefficient of 0.20 were generally as heavy as outbred animals of the same blood line, but those inbred more intensely were lighter at maturity (72 mo.). Height of withers was not a reliable measure of growth beyond 42 mo. Heart girth is a seemingly more reliable measure of growth than withers height and a more economic measure than body weight. The smaller heart girth, withers height, and body weight at first calving (28 mo.) for highly inbred females after normal development from birth suggest a possible relationship between gestation or parturition and the failure of these animals to follow normal growth development to maturity.

**Breeding systems used to produce the highest yielding Guernsey and Holstein cows**, S. A. ASDELL. (*Cornell Univ. (Jour. Anim. Sci., 4 (1945), No. 2, pp. 146-150*).—The breeding data of the 100 highest fat-yielding Guernsey cows and the 100 highest milk-yielding Holstein cows published in the herd books of these breeds were analyzed for inbreeding by methods of Wright (E. S. R., 48, p. 468). The average coefficient of inbreeding found in each case was close to the average

for the breed as a whole. No system of breeding was especially noteworthy in the production of superior animals, but there is a suggestion that reduction of strong inbreeding has an advantage. Superior parents were more important than the system of inbreeding followed. Among the Guernseys the average coefficient of inbreeding was  $1.97 \pm 0.22$  percent, and among the Holsteins  $1.79 \pm 0.19$  percent.

**A study of the gestation periods of five breeds of cattle**, E. A. LIVESAY and U. G. BEE. (W. Va. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 13-14).—Among the gestation periods of five cattle breeds at the station, the Aberdeen Angus, Hereford, Jersey, Ayrshire, and Holstein cows averaged 280.5, 285.2, 277.9, 277.8, and 278.3 days, respectively. The three dairy breeds thus showed a significantly shorter gestation period of 5.8 days than the beef breeds.

**A new type of animal pedigree**, E. G. MISNER (*Cornell Univ., Dept. Agr. Econ. A. E.* 521 (1945), pp. 36+).—A new system of identifying different ancestors by suitable combinations of odd and even codes set up in Roman and Arabic numbers for the two sexes makes it simpler to show the relationships of daughters to the production of their ancestors and bring out an evaluation of the inheritance of any given animal. Examples are given, with an analysis of production records and conversion factors.

**The artificial insemination of farm animals**, edited by E. J. PERRY (*New Brunswick, N. J.: Rutgers Univ. Press*, 1945, pp. 265+, illus. 47).—Following a general historical description of artificial insemination and its advantages and limitations, chapters are included on Organs of Reproduction, by J. Edwards (pp. 13-30), procedures (pp. 31-53), and, under methods of artificial insemination of different classes of animals, on Cattle (pp. 54-75), Sheep, by C. E. Terrill (pp. 76-98), Horses and Jackstock, by V. R. Berliner (pp. 99-132), Birds, by F. P. Jeffrey (pp. 133-144), and Swine (pp. 145-149). Chapters are also included on breeding better livestock (pp. 150-178), systems of breeding (pp. 179-196), selection of sires (pp. 197-215), cooperative artificial breeding associations (pp. 216-238), shipping of semen (pp. 239-244), disease in relation to artificial insemination (pp. 245-251), and feeding and management of sires (pp. 252-259).

**The artificial insemination of cattle**, S. BARTLETT and J. MACKINTOSH (*Jour. Roy. Agr. Soc. England*, 105 (1944), pp. 175-189, illus. 1).—Methods of collecting, handling, and transporting semen are described, including descriptions of insemination centers and relation to herd improvement and disease control.

**The percentage of conception in the artificial and natural breeding**, J. D. SAM-PATH KUMARAN (*Indian Vet. Jour.*, 21 (1944), No. 3, pp. 137-140).—Monthly variations in the percentages of conceptions from natural and artificial insemination from 1925 to 1939 in the Pusa Sahiwal herd are presented.

**The reliability of estimates of the proportion of morphologically abnormal spermatozoa in bull semen**, G. W. SALISBURY and E. MERCIER. (*Cornell Univ. Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 174-178).—The proportion of abnormally formed spermatozoa calculated on the examination of a single unit of 100 spermatozoa was as reliable as the ability of a single investigator to make two slides from the same ejaculate of semen and to examine 500 cells from each one. The data also showed that improvement in the reliability of making the morphological classification of spermatozoa was as rapid, as an investigator gained experience. In the conduct of this investigation, 500 spermatozoa were examined from each smear, classified as to units of 100 spermatozoa each.

**Alteration of the estrual cycle by pituitary gonadotropins and persistence of the effects upon reproductive performance in ewes**, L. E. CASIDA, R. H. DUTT, and R. K. MEYER. (*Univ. Wis. Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 24-33).—The 30 grade ewes used in this study were divided into 6 groups of 5 ewes each. Unfractionated pituitary extracts were administered subcutaneously to 3 of the

groups. The other 3 groups received subcutaneous injections of a purified extract of a follicle-stimulating hormone of the pituitary gland at the fourth, eighth, and twelfth days, respectively, of the estrus cycle. The occurrence of estrus was determined by checking twice daily with a teaser ram. On the second day after the last subcutaneous injection, an intravenous injection of unfractionated extract was given. Treatment with the unfractionated extract increased with the length and variation of the estrus cycles. There was no evident effect of follicle-stimulating extract upon the current estrus cycle when treatment was begun on the fourth or the twelfth days. Treatment with either extract shortened the first estrus period subsequent to the end of treatment with the extract in the 4 and 8-day groups, but in the 12-day group the periods were shorter for the unfractionated and longer for the follicle-stimulating extract than for the controls. There were 10 conceptions in 20 inseminations among 15 ewes receiving unfractionated extract, and 14 ewes conceived from 19 inseminations of ewes receiving follicle-stimulating extract. Breeding was begun at the first estrus after the end of the treatment. Neither extract caused any practical gain in controlling the time of the estrus, but in general greater physical disturbances followed the use of unfractionated than of follicle-stimulating extract.

The necessity of the corpus luteum for maintenance of pregnancy in the ewe, L. E. CASIDA and E. J. WARWICK. (*Univ. Wis.*). (*Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 34-36).—Normal lambs were produced by two of six pregnant ewes ovariectomized between 54 and 77 days of gestation and by two (questionably three) of four ewes ovariectomized or subjected to corpora lutea removal at 99 to 103 days of gestation. One ewe having a corpus luteum removed at 30 days of gestation aborted 2 days later. In at least some cases ewes can maintain pregnancy without the presence of corpora lutea after 55 days of gestation.

The effect of sex on the development of the pig.—IV, Histological and endocrinological studies of the boar, W. W. GREEN and L. M. WINTERS. (Minn. Expt. Sta. and U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 55-62, illus. 3).—In continuation of this series (E. S. R., 91, p. 401), study was made of the inbred lines being developed at the Minnesota Experiment Station as to their characteristics for fertility, age of puberty in both sexes, and degree of sex interest in boars. Testes were histologically examined and assayed for male hormones from 78 boars ranging from 8 to 28 weeks of age at the time of castration. The extraction and assay methods used were those previously described (E. S. R., 87, p. 657).

Differences were found in the amount of male hormones excreted in the urine of different lines and in the rate of increase in the weight of the testes, numbers of spermatogonial cells, and numbers of primary spermatocytes. Differences were also found in the diameters of the interstitial cells. Sexual desire was found to have considerable relationship to the excretion of 17-ketosteroids (male hormones) by the line. Various lines illustrated the independent occurrence of factors usually associated with sexual development—age of appearance of raring, degree of sex drive, development of sex characteristics, and growth of seminiferous elements. Even though it is possible to develop lines possessing both early sexual development and rapid economical gains, breeders are still confronted with the problem of selecting individuals and trying to estimate the effects of gonads on body growth and type. In studying problems dealing with sexual maturity in boars, consideration should be given to differences in genetic constitution of the animals, season of farrow, and season of the year in which the data are collected.

The chemistry and physiology of hormones, edited by F. R. MOULTON (*Washington 25, D. C.: Amer. Assoc. Adv. Sci.*, 1944, pp. 243+, about 50 illus.).—The following papers on the general subject are presented: The Isolation and Chemistry of Anterior Pituitary Hormones Influencing Growth and Metabolism, by A. White

(pp. 1-25); The Chemistry of Gonadotrophins of Pituitary Origin, by B. F. Chow (pp. 26-27); The Chemistry and Physiology of the Posterior Lobe of the Pituitary Gland, by G. W. Irving, Jr. (pp. 28-46); The Pituitary Growth Hormone, by W. Marx and H. M. Evans (pp. 47-56) (Univ. Calif.); The Isolation and Chemistry of the Adrenal Hormones, by M. H. Kuizenga (pp. 57-68); The Chemistry of Insulin, by H. Jensen (pp. 69-73); The Physiological Action of Insulin, by F. D. W. Lukens (pp. 74-82); The Physiological Action of the Adrenal Hormones, by D. J. Ingle (pp. 83-103); Euthyroidism and Thyroid Dysfunction, by W. T. Salter (pp. 104-128); Synthesis of the Steroid Hormones, by E. Schwenk (pp. 129-143); The Isolation and Chemistry of Human Chorionic and Pregnant Mare Serum (Equine) Gonadotrophins, by S. Gurin (pp. 144-151); The Gonadotrophic Function of the Pituitary Gland, by H. L. Fevold (pp. 152-161) (U. S. D. A.); The Physiology of the Gonadotrophic Substances of Blood, Urine, and Non-hypophyseal Tissues, by L. Levin (pp. 162-173); The Hormones of the Gastrointestinal Tract, by H. Greengard (pp. 174-178); The Present Status of the Antihormone Problem, by K. W. Thompson (pp. 179-185); The Excretion of Steroid Hormones in Urine, by T. F. Gallagher (pp. 186-194); and I, Concerning the Biochemistry and the Physiological and Clinical Significance of the Sex Hormones and 17-Ketosteroids; II, Neuro-Endocrine and Cyto-Physiological aspects of Adenohypophysial Function, by H. B. Friedgood (pp. 195-209). An extensive combined bibliography is included.

**Annual review of physiology, VII**, edited by J. M. LUCK and V. E. HALL (Stanford University, Calif.: *Ann. Rev., Inc.*, 1945, vol. 7, pp. 774+).—Among the articles included in this book are: Physiological Aspects of Genetics, by S. Wright (pp. 75-106); Developmental Physiology, by D. H. Barron (pp. 107-126); Physiological Effects of Heat and Cold, by A. Hemingway (pp. 163-180); Energy Metabolism, by H. E. Himwich (pp. 181-200); Digestive System, by B. P. Babkin and M. H. F. Friedman (pp. 305-330); Metabolic Functions of the Endocrine System, by D. J. Ingle (pp. 527-566); Hormones in Reproduction, by R. K. Meyer (pp. 567-598) (Univ. Wis.); and Applied Physiology, by J. H. Comroe, Jr., and R. D. Dripps, Jr. (pp. 653-676). Extensive author and subject indexes to references in the articles are presented.

**The relation of the placenta to the growth of the mammary gland of the rat during the last half of pregnancy**, S. L. LEONARD. (Cornell Univ.). (*Anat. Rec.*, 91 (1945), No. 1, pp. 65-75, illus. 8).—Studies were made of the mammary glands of rats on the twenty-second day of pregnancy and pregnant rats subjected to removal at midpregnancy of the hypophyses, ovaries, placentas, and fetuses alone and in all possible combinations. The fully developed mammary gland was obtained when the hypophyses, ovaries, and placentas were intact. Only the level of the mammary gland growth found on the nineteenth day of pregnancy was stimulated by combinations of the hypophyses and ovaries or by the hypophyses and placentas. Groups of about 2 to 5 rats were treated in these ways. The results thus indicate that the placenta has an endocrine function. The active principle or principles of the placenta work synergistically with hormones of the hypophysis and ovaries to control mammary gland growth during the second half of pregnancy.

**Effect of graded doses of thyroxine on metabolism and thyroid weight of rats treated with thiouracil**, E. P. REINEKE, J. P. MIXNER, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 36 (1945), No. 1, pp. 64-67, illus. 1).—The daily administration of 0.1 percent of thiouracil in the drinking water for 2 weeks to young rats depressed the metabolic rate 23.7 percent and the thyroid weight was more than doubled with thiouracil alone. The metabolic rate was returned to normal by the daily injection of 4.75 µg. of *d,L*-thyroxine. Approximately

4.8 µg. of *d,l*-thyroxine were required to return the thyroid weight to normal. Fourteen groups of 4-30 rats each were injected with 0-7.5 µg. daily per rat of the thiouracil in the drinking water.

**Strain differences in the choline requirement of rats**, D. H. COPELAND. (Ala. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 1, pp. 33-35).—The F<sub>2</sub> generation of two strains of rats showed significant differences in their requirement of choline, as indicated by Engel (E. S. R., 89, p. 528). The minimum daily requirement of choline was 4-6 mg. per rat in one strain and 10 mg. for another strain on the same ration. The difference in choline requirements thus continued through at least three generations. The number of survivors showing normal kidneys was much greater in one strain than in the other.

**Antihormone formation following the administration of gonadotrophic extracts**, J. H. LEATHEM. (Rutgers Univ.). (*Endocrinology*, 36 (1945), No. 1, pp. 67-70).—Daily injection of eight rabbits with 0.3 cc. of combination of gonadotropins for the first 4 days of each week over a 3-week period elicited the production of antigenadotropic hormone which when administered to rats and mice with gonadotropic hormones prevented the increase of the ovarian and uterine weights. Some of the rabbit serum was administered subcutaneously and some intravenously. Subcutaneous injection was more effective in causing the antigenadotropic hormone formation.

**General appearance, growth, and reproduction of thyroidectomized bovine**, A. A. SPIELMAN, W. E. PETERSEN, J. B. FITCH, and B. S. POMEROY. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 329-337, illus. 7).—Data accumulated in connection with thyroidectionomy of bovines (E. S. R., 91, p. 588) are presented on one male and five females. The effects of thyroidectionomy upon the general appearance and behavior of immature and mature cattle were analogous to those reported for other mammals. Partial thyroidectionomy failed to produce any symptoms of hypothyroidism in immature or mature bovines. Growth was definitely retarded but resumed during the late stages of pregnancy, probably due to the effects of the thyroid of the developing fetus. Although the physical manifestation of estrus and male breeding behavior was lacking, the production of fertile ova and sperm occurred as three normal calves were produced from thyroidectomized parents. Thyroid therapy restored normal breeding behavior in both sexes.

**Natal testis weight and early post-natal body growth in the domestic fowl**, R. G. JAAP and R. B. THOMPSON. (Okla. Expt. Sta.). (*Growth*, 8 (1944), No. 4, pp. 311-319).—Study of 1,573 testis weights and records during early growth of 880 chicks showed that the strains having large natal testis weights grew more rapidly in the early post-natal period. Within the limits of this experiment, natal testis weight was not affected by body weight of the chicks or the time of hatching. Variations in natal testis weight were highly heritable. The effects of both sex-linked and autosomal genes on hybrid vigor was shown in reciprocal breed crosses. The potential growth rate of different strains, the relation to early sexual maturity of females, and the endocrine basis for variations in natal testis size are briefly described. In 198 day-old White Leghorn male chicks, size variations in the genital eminence were probably independent of testis weight.

**Influence of the early-feathering gene upon a chick's growth rate**, D. C. WARREN and L. F. PAYNE. (Kans. State Col.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 191-192).—In each of eight comparisons of male and female chicks at 12 weeks of age, it was noted that the early-feathering chicks were heavier than those which were late in feathering. Early feathering might have been more beneficial in a stock showing especially poor feathering.

**Bio-electric potentials and vital activity of the egg,** A. L. ROMANOFF. ([N. Y.] Cornell Expt. Sta.). (*Biodynamica*, 4 (1944), No. 93, pp. 329-358, illus. 10).—From the time avian eggs are laid to the beginning of incubation, electrical potentials are greater in fertilized than in unfertilized chicken eggs (0.8 mv against 0.2 mv.). The magnitude of the bio-electric potentials can be increased by electrical stimuli, by X-ray and ultraviolet radiation, by high-frequency fields, and possibly by an increase in the oxygen concentration. "It is certain that the source of energy for the development of electric potentials is the metabolic activity of the organism."

**Hydrogen-ion concentration of albumen and yolk of the developing avian egg,** A. L. ROMANOFF. ([N. Y.] Cornell Expt. Sta.). (*Biol. Bul.*, 87 (1944), No. 3, pp. 223-226, illus. 1).—In studies to ascertain whether changes in the pH of the eggs of several species were similar, observations on incubated eggs of the chicken, pheasant, quail, turkey, duck, and goose clearly indicated that changes in the pH of albumen and dense and liquefied portions of yolk are similar in all the species studied and suggested a characteristic pattern for all avian eggs. There is a rapid rise in the pH of the albumen during early incubation, then a fall during the rest of the incubation period. In the dense yolk there is a gradual rise with a slight fall at hatching. The pH value of the liquefied yolk remains high throughout its existence. The initial pH value of albumen during embryonic development depends chiefly on the preincubation age of the egg. In fresh eggs it is low, increasing with the age of the egg.

**Maturation, fertilization, and early cleavage of the egg of the domestic turkey,** M. W. OLSEN and R. M. FRAPS. (U. S. D. A.). (*Jour. Morphol.*, 74 (1944), No. 2, pp. 297-309, illus. 24).—The sequence of developmental changes in the turkey egg during the 48-hr. period preceding and the 8-hr. period following ovulation are described. Maturation in the turkey egg as in the chicken egg (E. S. R., 87, p. 658) is initiated shortly after ovulation. In follicles approaching maturity the germinal vesicle is located close to the vitelline membrane and in the center of the germinal disk. The vesicle is approximately one-fourth the diameter of the germinal disk and measures about 0.6 mm. The walls of the vesicle begin to disintegrate about 24 hr. before ovulation. Disintegration typically begins along the upper surface of the vesicle, allowing the fluid contents to escape. The material spreads laterally, and near ovulation it appears in the microscopic section as a thin sheet beneath the vitelline membrane. The first polar body is extruded during the later stages of vesicular breakdown, 1-2 hr. before expected ovulation. The second is probably extruded following ovulation, as in the hen's egg, but proof of this is lacking. Fertilization occurs in the infundibulum a few minutes after ovulation. Accessory cleavage resulting from supernumerary sperm occurs in the turkey egg as in the egg of the pigeon and chicken. Cleavage is initiated while the turkey egg is in the isthmus, or about 5 hr. after ovulation. The first cleavage furrow appears as a line almost crossing the central portion of the germinal disk, and the second approximately divides the first two blastomeres. The 8-cell stage is attained by the formation of two cleavage furrows parallel with the first. Central and marginal cells are distinguished at the 16-cell stage. Cleavage patterns are subject to wide variation in the formation of the 16-cell and later stages, but apparently without relation to the course of normal embryonic development.

**Inheritance of breast width in turkeys,** V. S. ASMUNDSON. (Univ. Calif.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 150-154, illus. 1).—Study of the weights, depth of body, length of shank, length of keel, and width of breast at five different locations of two strains of turkeys and reciprocal crosses and backcrosses between them indicated that the two strains differed significantly in size and width of the breast. The differences in breast width were determined by more than one pair

of autosomal genes, and at least some of the genes acted independently of the genes for weight and size. The study was based on analysis of variance of these measurements at 24 weeks of age on 125 males and 136 females born in 1941 and 289 males and 299 females born in 1942, from the two strains, hybrids, and backcrosses.

**Growth rates of the primary flight feathers of the pigeon and the effects of X-radiation**, R. E. FRISCH. (Wis. Expt. Sta.). (*Jour. Expt. Zool.*, 97 (1944), No. 3, pp. 199-229, illus. 11).—A study was made of the growth rates of untreated and X-rayed primaries of the juvenile and first adult plumage of the pigeon using 33 squabs, 10 of which were untreated and 23 which were X-rayed on one side. The growth curve of the primaries can be represented by the integral of a normal error curve. Methods of computing the maximum absolute growth rate, the largest number of millimeters grown per day, and the maximum relative growth rate, the largest number of millimeters grown per day divided by the final length of the feather, are given.

In the juvenile plumage, primaries 5, 6, 7, and 8 (numbering proximally from P. 1 at the tip of the wing) grow at the fastest rate; a decrease in growth rate takes place laterally in both directions from this group: P. 8>9>10; P. 5>4>3>2>1. An increase in final length of the primaries after the first molt was found to result from an increase in rate of growth, duration of growth, or both. Squabs were irradiated with 1,000 r. (roentgens), 1,500 r., or 2,000 r. at a varying interval after hatching. Although the maximum absolute growth rate of the X-rayed feathers was significantly slower than controls at all dosages, the maximum relative growth rate (and therefore the shape of the growth curve) did not differ from that of controls at any dosage. This suggested that the axial growth of the feather was reduced by a constant factor after the radiation.

## FIELD CROPS

**A uniform method of analysis for square lattice experiments**, C. H. GOULDEN (*Sci. Agr.* 25 (1944), No. 3, pp. 115-136).—Fundamental characteristics of square lattice designs are discussed, and a generalized method of analysis is presented for all such designs. A table shows the possible types of square lattice designs within a useful range of numbers of varieties and replicates and certain recommendations are made.

**On the analysis of a certain six-by-six four-group lattice design**, B. HARSHBARGER. (Va. Expt. Sta.). (*Am. Math. Statist.*, 15 (1944), No. 3, pp. 307-320).—The statistical method for the analysis of such a design, where each group is duplicated, is developed and the results applied to an actual problem. The least square solution, as developed, uses only the intrablock information to correct the varieties for block effects.

**A study of phytosociological relationships by means of aggregations of colored cards**, W. T. PENFOUND (*Ecology*, 26 (1945), No. 1, pp. 38-57, illus. 2).—Effects of changes in quadrat size, number of species, and total cover on the sampled frequency, density, and cover of species were studied by means of an analysis of aggregations of colored cards.

**Studies of crop production in the United States, 1940 to 1943**, E. ÅBERG (*K. Lantbr. Högsk., Inst. Växtodlingslära Skr. (Roy. Agr. Col. Sweden, Inst. Plant Husb., Pubs.)*, 1 (1944), pp. 86+, illus. about 32).—Crop production and improvement problems under study by the State agricultural experiment stations and the U. S. Department of Agriculture are reviewed under the topics—soils and fertilizers; rangelands, pastures, and meadows; corn; barley; wheat and rye; oats; peas and beans; soybeans; flax; hemp; sorghum; potatoes; sugar beets; seed quality; weed

eradication; artificial means of disease control; and trends in crop production during the present emergency. Scientific problems accorded special attention include the design of experiments; competition between crop plants grown in mixtures; hormones and their use for practical purposes; modern principles in corn breeding and their use in breeding other cross-pollinated crops; combining ability in plant breeding; composite cross-breeding methods in barley; *Triticum timopheevii* as a source of disease resistance in wheat; some data on interspecific crosses, cytology, and cytogenetics of value for the breeding of crop plants; waxy endosperm in crop plants; methods of testing breeding products; technic for testing small seeded grasses; and use of Sinox for weed control.

[*Farm crops research in Mississippi*] (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 3, pp. 1, 2, 7, 8).—Progress results of current research are set forth in articles entitled: Increase Oat Yields With Nitrogen, by J. Pitner (p. 1); The National Cotton Research Program, by F. J. Welch (p. 1); Pastures, Like Other Crops, Respond to Fertilization; Phosphate the Primary Need, by H. W. Bennett (pp. 1, 7); Bur Clover Best Turned About the First Week in April (pp. 1, 8); 3-Year Study of Seed Treatment for Cotton Summarized, by J. A. Pinckard (p. 2); Fertilizer and Legumes for Corn and Cotton, by J. Pitner (p. 7); Tung Meal Good Nitrogen Source in Poplarville Test, by T. E. Ashley and R. Coleman (p. 8); and Soybean Varieties: Raymond, College, and Holly Springs, by J. F. O'Kelly (p. 8).

**Varieties of farm crops for Montana, 1945** (*Montana Sta. Cir. 182* (1945), pp. 35, illus. 1).—A revision for 1945 (E. S. R., 91, p. 276).

**Common range forage types of the inland Pacific Northwest.** R. R. HUMPHREY. (U. S. D. A.). (*Northwest Sci.*, 19 (1945), No. 1, pp. 3-11, illus. 7).—Important forage types characteristic of the area, described from observations 1939-44, include the Palouse bunchgrass, ponderosa pine-grassland, sagebrush, bitterbrush-grass, perennial weed, and annual types.

**A comparative study of natural and artificial revegetation of land retired from cultivation at Hays, Kansas.** A. RIEGEL (*Kans. Acad. Sci. Trans.*, 47 (1944), No. 2, pp. 195-214, illus. 12).—Though the major part of the cropland in the central and western Great Plains has been under cultivation for 25 yr. or less, many fields have been abandoned for various reasons and allowed to be revegetated by nature. Various surveys have indicated that the return of the more important native grasses to these fields is slow, and that establishment of the original disclimax vegetation requires many years. A cultivated field on the college farm at Hays was retired from cultivation in 1920 and made a part of the native grass pasture; 12 yr. afterward buffalo grass covered about 10 percent of the area, and 3 yr. later there was an increase to about 35 percent. The grasses of the field totaled about 36 percent at 24 yr. after retirement from cultivation; 26 percent of this was buffalo grass and 2 percent blue grama, whereas the native short grass prairie at the same time had over 90 percent. A second field was retired and part of it sown to blue grama in the spring of 1941; this grass occupied about 16 percent of the area sown at the end of the first growing season and had attained a cover of 38 percent by 1943. Heavy infestations of weeds were present during the first two growing seasons but were few in number and size by 1943. In three seasons, blue grama seeded on retired farm land had a basal cover of grass exceeding that of the field which had undergone natural revegetation for 24 yr.

The cost per acre of natural revegetation is confined primarily to interest and taxes on the land; with artificial revegetation the immediate cost is considerable. An expenditure of over \$5 per acre was made in establishing the stand of blue grama, but after 3 yr. the seeded area had about the same carrying capacity for livestock as the area undergoing natural revegetation had at 15 yr. Clipping yields

of short grass indicated that blue grama and buffalo grass yield about the same amount of dry forage per 1 percent basal cover. Little forage of value for grazing was produced on the natural revegetation area during the first 10 yr. from cultivation. Calculated yields per acre for the two revegetation areas show that during the first 25 yr. after retirement from cultivation the field seeded to blue grama would have produced three times as much beef as the one undergoing natural revegetation. The cost of artificial revegetation could be liquidated within 10 yr. after reseeding.

**Excretion of nitrogen compounds by some legumes grown in sand culture,** H. G. MYERS. (Ky. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 2, pp. 81-89).—Grasses and associations of legumes and grasses were grown in sand cultures, and excretion was determined by observing benefit derived by the associated nonlegume during growth and by N analyses of plants in certain experiments. Effects of a number of differences in experimental procedures and growth conditions upon nitrogen excretion were tried. Grasses benefited six times in 157 associations with legumes, 114 being combinations of hairy vetch and Balbo rye. Evidence for excretion in 4 cases was conclusive. The gain by the nonlegume did not exceed 2.5 mg. of N per container in the 4 instances, whereas about 40 mg. of N were fixed per container.

**Grasslands of Argentina,** A. T. SEMPLE (U. S. Dept. Agr., *Agr. in Americas*, 5 (1945), No. 4, pp. 70-72, 75, illus. 3).—Dominant grasses in pastures of the pampas are described from a survey in 1943, and comments are made on soil and management problems.

**Use adapted crop varieties** (*Res. and Farming [North Carolina Sta.]*, 3 (1945), *Prog. Rpt.* 2, pp. 4-6, illus. 4).—Features of the better adapted varieties of tobacco, corn (and hybrids), cotton, soybeans, peanuts, alfalfa, clover, lespedeza, and grasses for North Carolina are pointed out.

Lime is important to permanent pastures and permanent pastures are important to livestock, W. W. WOODHOUSE, JR. (*Res. and Farming [North Carolina Sta.]*, 3 (1945), *Prog. Rpt.* 2, pp. 1-2, illus. 1).—Yields of permanent pastures have increased from 25 to 200 percent in response to limestone and further gains were made when phosphate was added with the limestone.

**Colour and practical value of clover seed.**—Preliminary report, H. OSVALD and E. ÅBERG (*Lantbr. Högsk. Ann. [Uppsala]*, 9 (1941), pp. 74-79; *Swed. abs.*, p. 9).—On the value of color in appraising clover seed.

Kaimi Spanish clover for humid lowland pastures of Hawaii, E. Y. HOSAKA (*Hawaii Sta. Cir.* 22 (1945), pp. 8+, illus. 7).—Kaimi Spanish clover (*Desmodium canum*), native of West Indies, is described as a good pasture plant for humid lowland regions of the tropics, having appropriate palatability, persistence, growth habit, recovery, and seed production. Resembling common Spanish clover (*D. uncinatum*), it is a long-lived, prostrate-to-upright plant with upright bearing stems, lanceolate leaves with a white marking in the center, and decumbent to creeping stems on which oval to round leaves without leaf-markings develop. When the plant is cut or trampled, there is a development of strong decumbent and prostrate stems, which root at the nodes where they lie on moist ground. This legume grows rather slowly in the early stages; in the first month it spreads about 8 in., but after 6 mo. grows more rapidly by rooting and branching at the nodes, and in a few years a plant may attain a spread of 15 ft. or more. While Spanish clover makes its best growth between 1,000 and 3,000 ft. in altitude with 35 to 55 in. of rainfall, Kaimi Spanish is best adapted to zones below 1,000 ft. with 50 in. or more of rainfall a year. Although this legume is tolerant to soils of relatively high acidity and low Ca and P content, it responded remarkably to Ca and P fertilizers.

The plant endures grazing remarkably well and flourishes in association with sod-forming perennial grasses such as kikuyu, buffalo grass, Bermuda grass, and paspalum grass. Its feeding value compared favorably with that of alfalfa and koa haole.

Methods of establishing Kaimi Spanish clover in Hilo grass (*Paspalum conjugatum*) and paspalum pastures were studied at Kaupakulua, Maui. Results after 1 yr. indicate that for a fair stand the ground should be fairly open so that seedlings can get a foothold. Associated grasses should be kept short by clipping or light grazing, as the seedlings do not develop normally in shade. In establishing the legume in poor pastures of Hilo grass, ricegrass, and yellow foxtail, the area should be grazed closely and the seed broadcast a few days before removing the animals. Kaimi Spanish clover reaches more or less of an equilibrium with established sod-forming grass species.

Germination studies showed that unthreshed seed germinated as well as threshed seed, that some hard seed were present in mature pods; and that low germination of seed from green pods was due to immaturity. After 3 mo. of storage under ordinary conditions, percentage of hard seed increased from 18 to 72, while in seeds stored for a year it decreased to 30 percent. Seeds a few weeks to a year old gave the highest (90 to 96 percent) germination when treated for 9 to 13 min. with 55 percent sulfuric acid. Seeds rubbed with sandpaper for a few minutes gave equally good germination. Mechanical scarification is recommended for treatment of a large quantity of seed.

**The 1944 Iowa corn yield test, F. RERS and J. L. ROBINSON.** (Coop. U. S. D. A. et al.). (*Iowa Sta. Bul. P71* (1945), pp. 369-416, illus. 1).—The 256 section entries in the 12 fields of the 1944 test were grown cooperatively and in the same groupings (E. S. R., 91, p. 29). Yields, performance score, and other agronomic data are tabulated for each entry, results during several years are summarized, and the test methods and seasonal conditions are described. The average acre yield for all fields, 76.63 bu., was 6.5 bu. below 1943, the highest on record, while the average stand was 84.9 percent. Lodging averaged 4.7 and dropped ears 0.3 percent, compared with 15.1 and 1.1 percent, respective 10-yr. averages. The highest-performing (average) section entries with scores in 1944 in regular hybrid and experimental hybrid classes, respectively, were for the northern section Maygold 99A, Iowa Hybrid 4390; north-central section 22-H (Holden), Iowearth QAQ; south-central section 218-H (Holden), W-205 (Wilson); and for the southern section U. S. Hybrid 13, 3933 X 3934 (genetics section).

**Effects of early topping on ratooned American-Egyptian cotton, R. H. PEEBLES.** (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 2, pp. 90-95).—To determine whether distinguishing characteristics of ratooned (E. S. R., 91, p. 281) American-Egyptian cotton are inherent or due to the earliness of its reproductive period, alternate sections in a plot of the Amsak variety were topped 1 week after the first flower appeared, causing an initial delay of 5 weeks. In comparison with untreated cotton, the topped definitely resembled annual cotton in yield, lint percentage, lint index, staple length, seed fuzziness, seed index, and fiber fineness, although its fiber was stronger. Seasonal climatic factors apparently involved were drying atmospheric conditions and length of day, both reaching their maxima in June, the month during which ratooned cotton flowers most freely in southern Arizona. The mere fact that ratooned cotton develops new aerial parts from a fully developed root system did not in itself seem to have important effects on the seed cotton and fiber characters.

**Polarized light preferred for maturity tests, M. A. GRIMES.** (Tex. Expt. Sta.). (*Textile World*, 95 (1945), No. 2, pp. 161, 163, 214, 216).—No significant differences were evident in results obtained by the sodium-hydroxide method and

the polarized-light method of determining the maturity of cotton fibers. The polarized-light method consumed less time and labor and had other advantages.

**Malvaceous bast fiber studies**, D. R. ERGLE, B. B. ROBINSON, and J. M. DEMPSEY. (U. S. D. A. coop. Ala. Expt. Sta. et al.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 2, pp. 113-126, illus. 2).—*Hibiscus cannabinus*, *H. sabdariffa*, var. *altissima*, and *Urena lobata* grown experimentally in 1943 near Atmore, Ala., were studied for possible use as emergency sources of bast fiber. While environmental requirements, climatic and edaphic, seemed adequate for growth, these or other factors were not suitable for maturation of seed. Flowering occurred late or not at all, confirming results of others on the influence of photoperiodism. Maximum acre yields of mill-run fiber were from *H. cannabinus*, 3,103 lb.; var. "altissima," 2,791 lb; and *Urena lobata* at the 25-lb. seeding rate, 1,482 lb., and at 50-lb. 2,016 lb. These yields are deemed good compared with yields reported in countries where these plants are grown commercially.

A chemical method of fiber extraction, developed and used to follow changes in purified fiber content of plants throughout their growth cycle, gave lower but consistent and reproducible value as compared to results obtained by biological retting and subsequent mechanical extraction. Study of progress of fiber formation during growth and development of the plants showed somewhat similar increases in fiber content during early growth and decrease in extractable fiber content near maturity. Fibers from water-retted plants were superior in strength and quality to fibers prepared by dew retting. Under the conditions of experimentation, the fibers of var. *altissima* and *U. lobata* were stronger than that of *H. cannabinus*. The results on growth, fiber yields, mechanical processing, and fiber quality are held to justify consideration of these species as a domestic source of jute-like fiber if needed.

**Reproduction and pollination studies on guayule, *Parthenium argentatum* Gray and *P. incanum* H. B. K.**, L. POWERS and R. C. ROLLINS. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 2, pp. 96-112).—Field and greenhouse studies showed definitely that some plants of guayule and mariola are characterized by a high degree of facultative apomixis, and these apomictic plants are also pseudogamous. Of equal importance is the occurrence of collections of guayule almost if not completely sexual (in which both reduction and fertilization are taking place). To date all of these highly sexual forms have had 36+ chromosomes and no highly facultative-apomictic plants have been found among them. No predominantly normal-sexual plants of guayule (in which both reduction and fertilization occur) have been found among the 54±, 72±, and 108± polyploid groups. All collections of these groups studied to date have been predominantly facultative apomicts and are pseudogamous. Predominantly normal-sexual plants of mariola were of infrequent occurrence among collections of mariola. The evidence strongly supported the conclusion that some plants among these latter polyploid groups of guayule arise as a result of reduced pseudogamy, nonreduced pseudogamy, fertilization of reduced and unreduced gametes, and diplospory. So far, evidence has been obtained for occurrence in mariola of only nonreduced pseudogamy, and fertilization of reduced and unreduced gametes.

**Chemical and strength differences in dew-retted hemp fiber**, L. E. HESSLER. (U. S. D. A. coop. Ky. and Mich. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 2, pp. 146-155).—Retted hemp fiber, analyses showed, is composed of about 80 percent cellulose and lignin, while the remaining 20 percent or partially soluble fraction is made up of N compounds, pectic substances, pentosans, ash, and other extractable substances. Unretted hemp fiber consists of about 30 percent of the partially soluble fraction. Part of it is removed by retting in order to free the fiber. The fiber when exposed to microbiological action is weakened and, as a result, its breaking strength varies inversely with the duration of the retting period. Exposure to the sun shortened the time of retting. More damage to hemp fiber

during retting may occur when fresh green plants are retted than if the plants are allowed to cure by shocking. The younger top part of the plant may readily result in weaker fiber. Winter retting usually has been observed in practice, and, substantiated by these experiments, to result in a better color but weaker fiber than fall retting, a condition probably due to the slower, longer retting period. Winter-retted fiber was lower in the more soluble fractions, which indicates more retting. The seeding rate has had an effect on retting by giving lower cellulose and lignin values and higher concentration of the more soluble fraction at the higher rates of seeding. Fiber grown from Kentucky hemp seed had a different level of constituents and was stronger than fiber from the Chilean hemp. In general, breaking-strength tests were related to commercial fiber grades, although the lower grade had some of the strongest fibers, which could be attributed to under-retting.

**Varieties of kenaf (*Hibiscus cannabinus*), a bast fiber plant, in Cuba,** J. C. CRANE and J. B. ACUÑA. (U. S. D. A. et al.). (*Bot. Gaz.*, 106 (1945), No. 3, pp. 349-355, illus. 7).—The species of *Hibiscus* being grown in Cuba for soft fiber has been correctly identified as kenaf (*H. cannabinus*) instead of roselle (*H. sabdariffa*). Differences in seed characters and color of withered petals, as well as unlikeness in various floral parts and in appearance of stems, are suggested means of distinguishing these closely allied species. The botanical descriptions presented show that the two varieties of kenaf—*viridis* and *vulgaris*—identified as comprising the material grown in Cuba, are morphologically alike except for their leaves, *viridis* being characterized by cordate leaves only, whereas in *vulgaris* they are both cordate and palmately lobed. Differences in plant behavior within a particular variety suggest that these two are made up of several strains; this might offer a means of improving the plant for fiber purposes through selection of one or two of the most desirable characters. It is suggested that the differences in leaf shape are perhaps due to some ecological adaptation made during the evolution of the plant.

**Varieties of oats for Nebraska,** K. S. QUISENBERRY, O. J. WEBSTER, and T. A. KIESSELBACH. (Coop. U. S. D. A.). (*Nebraska Sta. Bul.* 375 (1945), pp. 16, illus. 6).—Oats varieties recommended for certain areas in the State from continued experiments (E. S. R., 83, p. 617; 93, p. 141) are Cedar, Otoe, Brunker, Fulton, and Kanota. Acceptable varieties are Tama, Boone, Vicland, Vikota, and Marion. Varieties no longer recommended include Columbia, Nebraska No. 21, Kherson, Burt, Vanguard, and Legacy. Acre yields, other agronomic characters, adaptation, and disease resistance are described for each variety, and appropriate production practices based extensively on experiments reported earlier (E. S. R., 68, p. 469; 69, p. 789) and farm experience are outlined.

**History, description, distribution, and performance of Ajax and Exeter oats,** J. N. WELSH (*Sci. Agr.*, 25 (1944), No. 2, pp. 96-106, illus. 2).—Ajax oats, derived from the cross Victory × Hajira made in 1930 at the Dominion Laboratory of Cereal Breeding, Winnipeg, is an early maturing variety, with good strength of straw and a medium sized white kernel, and appears fairly widely adapted in both eastern and western Canada. It is resistant to the common races of stem rust, moderately resistant to crown rust in the mature plant stage, and has a fairly high degree of resistance to smut and halo blight.

Exeter, from the cross Victory × Rusota made in 1929, yielded well in the Maritime Provinces and at Lennoxville, Quebec, while in western Canada it is better suited to the central and northern regions, particularly in areas where stem rust may occur. It is resistant to the common races of stem rust and has considerable resistance to halo blight, but is susceptible to other diseases, has slightly shorter straw than Victory, and is 2 to 3 days earlier in most places.

**Shattering in oats,** R. A. DERICK and D. G. HAMILTON (*Sci. Agr.*, 25 (1945), No. 7, pp. 427-431, illus. 1).—Varietal differences in resistance to shattering were

established for Canadian oats; machine shaking of panicles can be used to give an index of these differences. The greater the angle of spikelet attachment to the peduncle, the greater is the tendency to shatter. It is also believed that the greater the total area of the spikelet base and the thicker the sclerenchyma tissue at the attachment point, the greater will be this resistance.

**Potato breeding, genetics, and cytology:** Review of recent literature, F. J. STEVENSON. (U. S. D. A.). (*Amer. Potato Jour.* 22 (1945), No. 2, pp. 36-52).—The review covers 37 titles largely published in 1940-44.

**Erie**, a late potato adapted to Ohio, J. BUSHNELL, J. P. SLEESMAN, and F. J. STEVENSON. (Ohio Expt. Sta. and U. S. D. A.). (*Amer. Potato Jour.*, 22 (1945), No. 2, pp. 29-32).—Erie, a high-yielding potato, medium late in maturity and derived from Seedling 45146  $\times$  Earlaine, has outyielded three standard late varieties in tests in northern Ohio, although equaling them on muck soil. The plants resemble those of Green Mountain, the tubers are spherical with moderately deep and fairly numerous eyes, and the skin is an attractive white. In cooking tests, Erie surpassed Russet Rural in color and usually in texture. It has shown no particular resistance to virus diseases, scab, leafhoppers, and flea beetles. While evidently not inherently a specially high-yielding potato, it can thrive better than other varieties under the unfavorable conditions common to mineral soils in Ohio.

**The yield response of several commercially important potato varieties to the application of Bordeaux mixture**, J. P. SLEESMAN and J. BUSHNELL (*Ohio Sta. Bimo. Bul.* 233 (1945), pp. 73-75).—Each of 13 varieties of potatoes studied made an increase in yield after spraying with bordeaux mixture. Bliss Triumph, highly susceptible to leafhopper, gave the greatest increase and the resistant Sequoia the smallest.

**Placement of fertilizers for potatoes**, B. A. BROWN. ([Conn.] Storrs Expt. Sta.). (*Amer. Potato Jour.*, 22 (1945), No. 2, pp. 33-36).—Placing all of the P on the plow-sole greatly retarded the early growth of Green Mountain potato plants in Merrimac fine sandy loam and consistently reduced tuber yield by about 10 percent. None of the nine plow-sole placements employed resulted in significantly better stands, growth, or yields than the same quantity of fertilizer applied in two bands by the planter. Further and somewhat different tests in 1945 were planned.

**Storage of Irish potatoes in the lower South**, W. D. KIMBROUGH (*Louisiana Sta. Bul.* 386 (1944), pp. 17).—The investigations reported considered cold storage, common storage in summer, and high temperature storage of fall potatoes. In spite of their relatively high moisture content Louisiana spring-grown potatoes could easily be kept in cold storage until time to plant the next spring crop. If to be placed in cold storage, the potatoes should be kept from 1 to 2 weeks before under conditions favorable for healing of wounds and suberization of skins. The temperature should approximate 65° to 70° F. The greatest physiological shrinkage will be during this period. Results obtained, however, do not warrant keeping Louisiana spring-grown Triumphs for planting the next spring crop. Yields of cold storage Triumph seed were low, due to early maturity of the potatoes, which seemed to be correlated with the length of the dormant period. Limited results with several other varieties were similar to those obtained with Triumph. The Katahdin variety has been kept in cold storage for seed purposes successfully\* for several years. It is resistant to some of the potato diseases, but fields for seed should be rogued carefully. Potatoes spring grown in southern Louisiana could be kept successfully in common storage through the summer in the locality where grown. Katahdin potatoes have kept better than Triumphs and are more highly recommended for summer storage. A storage temperature of 80° proved to be excellent for fall grown potatoes to be used for seed for the spring crop. When kept at high temperatures fall potatoes as seed compared very favorably with northern certified seed. Katahdin tubers kept in cold storage produced yields as

good as Triumph potatoes from northern certified seed, but not as good as new certified Katahdin seed or fall-grown seed stored at 80°. Yields from spring Triumphs were poor.

Vernalization of rice by short days, S. M. SIRCAR and B. PARIJA (*Nature [London]*, 155 (1945), No. 3935, p. 395).—A further note (E. S. R., 91, p. 520) on results believed to show that the acceleration obtained has great possibilities for rice culture in Bengal.

Experiments with safflower in western Nebraska, C. E. CLAASSEN and T. A. KIESSELBACH (*Nebraska Sta. Bul.* 376 (1945), pp. 28+, several illus.).—Characteristics and growth habits of safflower (*Carthamus tinctorius*), its adaptations and commercial aspects, and diseases and pests are described. Varieties are compared and production practices are outlined, largely from results of experiments 1942-44 in western Nebraska.

Safflower, an oil crop adapted to areas with low relative humidity, makes best yields when the atmosphere is hot and dry during flowering, in conjunction with a favorable supply of stored subsoil moisture throughout the growing season. Its adaptation in Nebraska is limited approximately to areas with an elevation of 3,000 ft. or higher. Its extensive root system and branching habit enables the crop to adapt itself to a wide range of plant and row spacing. Planting rates suggested for dry land are solid drilling 30 to 45 lb. per acre, cultivated rows 12 to 28 lb.; and under irrigation, drilling 60 to 100 lb., rows 40 to 50 lb. Unless a field is relatively weed free, planting in cultivated rows is preferable, for plants of varieties high in oil content, currently available in quantity for commercial production, remain long in the rosette stage and therefore compete rather poorly with weeds. Plantings on dry land should be during the period April 25 to May 10, and on irrigated land prior to April 20, unless the season is late. Varieties tested in Nebraska do not differ markedly in seed yields, but do in oil content. Pusa No. 7, Ahmednager No. 1, and Simla have similar characteristics and are considered to be the best varieties currently available. All varieties of Russian origin tested so far are too low in oil to be considered for commercial production.

"Whether safflower of such varieties as are now available can be established as a profitable crop probably will be determined during the next few years, since industry is offering a market and farmers are undertaking its production on a semi-commercial scale in western Nebraska".

Nicotine content of *Nicotiana rustica* grown in Kentucky and of 15 selections of dark tobacco, C. W. WOODMANSEE, K. E. RAPP, and J. S. McHARGUE (*Kentucky Sta. Bul.* 470 (1944), pp. 11).—High-nicotine varieties (Brasilia and Olson) of *N. rustica* grown in the greenhouse produced tobacco of a nicotine content from 6.6 to 8.8 percent, calculated moisture-free, but in the field the nicotine content was reduced to 1.54-2.64 percent in the leaves of topped plants, and from 0.65 to 2.20 percent in plants permitted to go to seed. These varieties of *N. rustica* grown in the field were much inferior in nicotine production to dark tobacco grown at Princeton, which, in 15 selections, ranged from 4.9 to 6.2 percent in the leaf and from 4.4 to 5.9 percent in the lugs. *N. rustica* is believed not a dependable species for production of nicotine in Kentucky. Breeding of a high-nicotine strain of dark tobacco is held much more promising.

Increase in production and value of the wheat crop in Manitoba and eastern Saskatchewan as a result of the introduction of rust resistant wheat varieties, J. H. CRAIGIE (*Sci. Agr.*, 25 (1944), No. 2, pp. 51-64, illus. 1).—Growing of rust-resistant wheat varieties in Manitoba and eastern Saskatchewan, 1938-43, has increased, respectively, average annual wheat production and farm income in the "rust area" of western Canada by 41,339,000 bu. and \$27,242,000. Lack of present rust-resistant varieties during the 16 yr. 1916-28, 1930, 1935, and 1937, resulted in estimated average annual losses of 41,001,000 bu. and \$47,447,000 in farm income.

Agronomic and quality characteristics of Carleton durum wheat grown in the durum wheat area of western Canada, R. F. PETERSON and W. O. S. MEREDITH (*Sci. Agr.*, 25 (1944), No. 2, pp. 107-113).—Carleton durum (E. S. R., 89, p. 308) distinctly surpassed Mindum in strength of straw and in resistance to stem rust but was more susceptible to kernel smudge in variety tests at field stations, 1941-43. Other differences noted in agronomic characters did not seem important. In macaroni-making quality, Carleton appeared equal if not slightly superior to Mindum. Carleton probably will be useful in parts of the durum area of western Canada, particularly in Manitoba where stem rust damage and lodging average severer than in Saskatchewan.

Orfed wheat, O. A. VOGEL, S. P. SWENSON, and C. S. HOLTON. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 451 (1944), pp. 10, illus. 1).—Additional information on the merits of Orfed, a new variety of white wheat (E. S. R., 90, p. 477), is reported from experiments in 1939-44. Orfed has an awned erect spike with smooth white chaff, and a stiff, erect, medium tall straw, which is fairly fine and somewhat wiry in appearance; in fall seedings, compares very favorably in yield with the leading fall-sown wheat varieties; has not differed much from Federation in yield in spring seedings; has had a high average test weight in all locations; probably is as winter hardy as most leading commercial varieties of soft wheat, if not sown too early in the fall; is an early variety when fall-sown, and is 6 days later in date of heading than Federation when spring-sown; is about as resistant to lodging as Rex; is highly resistant to shattering; is highly resistant to all except T-16 and L-8 of the 26 known races of common bunt; it is more susceptible than Hymar and Rex to dwarf bunt, but more resistant than Triplet and Golden; is desirable for milling and baking; should not be fall-sown before October 15, and if sown in the spring, should be sown as early as possible because of its relatively late maturity as a spring-sown variety; and should be seeded at a rate not to exceed 60 lb. per acre.

Weed problems and weed control in the Yakima Valley, W. A. HARVEY (*Washington Sta. Bul.* 448 (1944), pp. 32, illus. 5).—The most serious weeds indicated in a survey of the Yakima Valley in 1938 were the whitetops—lens-podded whitetop (*Cardaria draba repens*), Siberian mustard (*C. pubescens*), and hoary cress (*C. draba*)—and Russian knapweed (*Centaurea repens*). Subsequent experiments revealed that the most practicable method for eradicating of these weeds from many areas was continuous clean cultivation (two seasons) with duckfoot sweeps at 3-week intervals. Irrigation during the cultivation period did not appreciably affect the kill but aided in the mechanics of cultivation. Areas were difficult to handle in row crops the year after cultivation and the yield was low, whereas fall-seeded rye for pasture or grain was more successful. Where the size of the infested area makes cultivation impracticable certain crops may be grown successfully. Alfalfa, in particular, corn, sugar beets, and millet or Sudan grass yielded well on land infested with lens-podded whitetop and held it in check. While eradication was not effected on any cropped areas during the experiment, further spread of the weeds was prevented and the land was producing satisfactory returns. Where there was much alkali (either high salinity or alkalinity or both) sugar beets were preferable to corn. Millet and Sudan grass were excellent one-season competitors with lens-podded whitetop. Sweetclover in a short rotation was not successful and potatoes were poor on this soil. CS<sub>2</sub> was the only chemical successfully eradicating all perennial weeds on which it was tested including lens-podded whitetop, Russian knapweed, camelthorn, slender perennial peppergrass, Canada thistle, and bindweed. Sodium chlorate eradicated bindweed, Russian knapweed, and Canada thistle, but like other chemicals tested failed to eradicate lens-podded whitetop or Siberian mustard. Flooding for 2 mo. during summer eradicated Russian knapweed, but longer than 3 mo. was needed to kill lens-podded whitetop.

Fallow flaming promising as a means of controlling alligator weed on sugar-cane lands, G. ARCEAUX and L. P. HEBERT. (U. S. D. A.). (*Sugar Bul.*, 22 (1944), No. 16, pp. 121-123).—Sugarcane on areas where alligatorweed (*Alternanthera philoecrooides*) infestation was extremely heavy made 3.36 tons per acre compared with 32.79 tons with no infestation and indicated respective sugar yields of 710 and 6,961 lb. per acre. In tests near Houma, La., plats flamed 12 times at weekly intervals beginning May 12, 1943 had only 157 lb. of alligatorweed root-rhizomes per acre on March 3, 1944, 1.4 percent of the 10,904 lb. where the standard practice was followed of planting soybeans in the 1943 spring and turning under August 3. Plats flamed 6 times at biweekly intervals contained only 395 lb. Other treatments, including frequent flaming, mowing, and a combination of mowing and flaming, did not give the degree of control realized with frequent flaming, but invariably resulted in significantly reduced rates of infestation as compared with the areas where soybeans were turned under. Even in fallow areas where alligatorweed grew undisturbed in competition with native vegetation and the growth was plowed under prior to cane planting, yields of roots and rhizomes dropped to levels below those in soybean plats.

"Centaurea repens," invasora de cultivos en la República Argentina [Invasion of croplands by Russian centaurea in Argentina], F. E. IBARRA and J. J. LA PORTE (*Rev. Argentina Agron.*, 11 (1944), No. 4, pp. 287-293, illus. 2).

Control of couch grass in Manitoba (*Canada Dept. Agr., Farmer's Bul.* 126 (1944), pp. 10, illus. 5).—Repeated shallow cultivations or diskings over several weeks, according to findings on the Brandon Experimental Farm and Melita Reclamation Station, will dry out and finally kill rootstocks of *Agropyron repens*. The cultivator equipped with narrow points is safer than the one-way disk on lands that erode readily. The disk is particularly useful on heavy and medium soils in early stages of cultivation. Harvest tillage of the first year grain stubble is recommended to prevent establishment of seedlings. Chemical eradication may be better where only a very few small patches exist.

Experiments on controlling hoary cress by cultivation, searing, and spraying, R. N. RAYNOR. (Calif. Expt. Sta.). (*Calif. Dept. Agr. Bul.*, 34 (1945), No. 1, pp. 17-26).—Experiments on the control of lens-podded hoary cress by cultivation, searing, and spraying were made 1941-44 in Yolo County, Calif., on subirrigated land where the root system penetrated 30 in. deep. Eradication was completed by 4 cultivations in the third season after cultivating 16 times at 3-week intervals for 2 seasons which gave 99 percent control and completed eradication, and after cultivating 12 times at 4-week intervals for 2 seasons which gave 95 percent control. Wild morning-glory, Russian knapweed, and alkali mallow growing under the same conditions were not eradicated by cultivating at 3- or 4-week intervals. Comparison of vaporizing and nonvaporizing burners for searing showed no difference in results. Searing at 3-week intervals from March 16 to December 7 (13 times) controlled hoary cress on ditchbanks, while searing 10 times at 4-week intervals during the same period reduced the stand about 70 percent. Searing appears to be strictly a process of depleting root reserves by repeated defoliation; the number of operations needed and the optimum interval between operations are of the same order as for cultivation. Spraying with diesel oil, or with a blend of diesel oil and 14° API gravity residual fuel oil, gave 90 percent control when repeated 5 times in 1 season. Three applications the next year brought the control up to 95 percent. Intervals between applications averaged 57 days. Spraying with 30 percent solution of sodium dinitro cresylate required repetition at shorter intervals than did spraying with oil; 6 treatments in 1 season at 39-day intervals effected 97 percent control.

"Euphorbia esula" in North America, L. CROIZAT (*Amer. Midland Nat.*, 33 (1945), No. 1, pp. 231-243).—This study reviews the adventitious noxious weed known to American agronomists and taxonomists as *E. esula* and *E. virgata* and con-

tains a brief account of the "esula" question, a critical study of the nomenclatorial position of *E. virgata*, and notes of detail on *E. esula*, *E. virgata*, *E. virgata orientalis*, *E. virgata montana*, *E. intercedens*, *E. uralensis*, *E. agraria*, *E. lucida*, *E. cyprissias*, *E. hebecarpa*, and *E. salicifolia*. Specimens available in American herbaria—authenticated by the author—are listed for each binomial. Two new records are established for the adventitious flora of America, *E. virgata orientalis* and *E. agraria*. It is believed that the great majority, if not the totality, of the plants known to American agronomists and taxonomists as *E. esula* and *E. virgata* are in reality *E. intercedens*. The legitimacy of *E. virgata* Wald. & Kit., 1805, at least temporarily, is affirmed against the previous publication of *E. virgata* Desf., 1804.

**Nature and rate of development of root system of *Gonolobus laevis*, J. C. FRAZIER.** (Kans. Expt. Sta.). (*Bot. Gaz.*, 106 (1945), No. 3, pp. 324-332, illus 6).—This is the fifth of a series of reports on the growth habits of perennial noxious weeds of the central United States (E. S. R., 92, p. 52). Plants of *G. laevis* (climbing milkweed)—grown from seed on a typical upland loam soil at Manhattan under known temperature and precipitation conditions and not subject to competition—were studied at various ages from seedlings through 25 weeks. The root system of well-established plants consisted of the original primary vertical root and from one to many permanent laterals which continued to grow horizontally and on which arose roots that grew either downward directly, or did so after short horizontal growth, to become secondary vertical roots. The plants spread horizontally via the permanent lateral roots, those of the first order arising on the primary vertical root. Branch laterals arose on the permanent laterals of the first order; similarly, permanent laterals of the third order arose on those of the second, and so on. Concurrent studies indicated that injury or too severe competition prevents extensive horizontal growth of all laterals. The plants spread 9 ft. radially in undisturbed soil and reached a depth of 3.5 ft. in a 25-week growing season. The source of shoot development—other than the plumule—was from root-borne buds which produced shoots directly (if at the ground line) or rhizomes (if below ground) which in turn gave rise to leafy shoots. There was no regularity in the location of these adventitious buds on the perennial lateral roots; no such buds were observed on the secondary vertical roots. The shoot development of old plants was wholly from root-borne buds. The type of development is similar to that of dogbane, and their common type exhibits certain similarities to, as well as differences from, the type common to field bindweed, hoary cress, and Russian knapweed. The horizontal spread in both types is via permanent lateral roots, but in the dogbane-climbing milkweed type the laterals continue to grow horizontally, not bending downward to produce vertical roots as in the other type. In the dogbane-milkweed type, secondary vertical roots arise on the permanent laterals. The development of shoots appears to be the same in both types. Field bindweed and climbing milkweed were only two of the five species to flower and fruit during the first growing season.

**Illustrations of some weed seeds mentioned in the Illinois seed law (Ill. Dept. Agr. Ann. Rpt., 27 (1944), pp. 140-145, illus. 11).**—Illustrations of seeds of 11 species of weeds, with comments.

**Selective herbicidal action in midsummer and fall applications of 2,4-dichlorophenoxyacetic acid, C. L. HAMNER and H. B. TUKEY.** (N. Y. State Expt. Sta.). (*Bot. Gaz.*, 106 (1944), No. 2, pp. 232-245, illus. 5).—Experiments conducted near Geneva, N. Y., used 2,4-dichlorophenoxyacetic acid (E. S. R., 92, p. 52) as a herbicide applied as a water spray at 1,000 p. p. m. in Carbowax 1500 at the rate of one part of acid to five parts Carbowax. Applications to bindweed in rows of nursery stock on July 14 and 31 resulted in drying out and killing of above-ground parts. Below-ground parts proliferated, became spongy and water-soaked, and de-

cayed to depths of at least 14 in. Acid applied in warm water ( $110^{\circ}$  F.) killed more uniformly and faster. In relatively cool weather ( $45^{\circ}$ – $75^{\circ}$ ) response was much slower, and complete killing occurred only after 3–4 weeks. Spraying sow-thistle resulted in lighter green color and wilted appearance within 24 hr. Lettuce bases became much enlarged and flattened, and roots increased 50–300 percent in diameter and became soft and spongy. All plants died within 2 weeks.

When field mixtures of common weeds were sprayed, bindweed, narrow-leaved plantain, dandelion, round-leaved mallow, lambsquarters, and ragweed were killed following varying formative responses. Pigweed, milkweed, tomato, broad-leaved plantain, Pennsylvania smartweed, purslane, chickweed, and red clover showed varying responses, including epinastic curvatures, splitting of stems, swelling of stems and roots, browning of leaves, stems, and roots, chlorosis of leaves and stems, elongation, chlorosis and enlargement of petioles, and killing of some plants. There were no visible effects upon quack-grass, Kentucky bluegrass, yellow foxtail, green foxtail, wild oats, large crabgrass, small crabgrass, barnyard grass, and goosegrass. Aerosol applications, using 2 percent 2,4-dichlorophenoxyacetic acid in 10 percent motor oil SAE 30 and 88 percent dimethyl ether, proved effective against bindweed, pigweed, and purslane.

After applications were made to an infested bluegrass lawn, all dandelion, buckhorn, plantain, and round-leaved mallow plants were dead and disintegrated within 30 days; most of the white clover was dead, and the remainder killed back to the main stolons; and bluegrass became dark green in color but otherwise not visibly affected. Germinating seedlings of white sweetclover emerging 3–7 days after the soil surface had been sprayed were completely killed. Twelve species of cereal, lawn, and pasture plants were sown on an area sprayed 2 mo. earlier, but the seeds germinated and young plants showed no curvatures, distortion, or other residual effects.

When a few woody plants were treated, apple showed minor curvature and mild chlorosis near the tips; poison ivy, chlorosis and arrested development and 50 percent killing of above-ground parts; red raspberry, formative effects 3–6 in. back from the tips; and dewberry and grape showed formative effects and killing 4 in. back from the tips.

**2,4-Dichlorophenoxyacetic acid as a differential herbicide**, P. C. MARTIN and J. W. MCCRACKEN. (U. S. D. A.). (*Bot. Gaz.*, 106 (1944), No. 2, pp. 224–232, illus. 5).—2,4-Dichlorophenoxyacetic acid was effective as a differential herbicide when applied at Beltsville, Md., as an aqueous spray in concentrations of from 250 to 1,000 p. p. m. or more, killing dandelion, narrow-leaf plantain, white clover, chickweed, pigweed, wood sorrel, knotweed, broad-leaf dock, bindweed, and shiny pennywort. Other plants, as broad-leaf plantain, sheep sorrel, daisy, yarrow, and *Rubus* spp. were relatively insensitive to the acid. Two applications of either 500 or 1,000 p. p. m. concentration of the acid in aqueous solution were made to well-established Kentucky bluegrass sod without apparent injury; and bluegrass seed planted under light top dressing of soil, which was then sprayed with these concentrations, germinated and readily became established in these lawn areas. About 95-percent control of dandelion and narrow-leaf plantain could be obtained by a single spray application of a solution containing 1,000 p. p. m. of the acid or with two applications at 500 p. p. m. "Caution should be exercised in the use of sprays containing the acid until more information is obtained concerning the effects of its presence in the soil."

**Results of tests of commercial legume inoculants in 1944**, L. T. LEONARD (*U. S. Dept. Agr. Cir.* 724. (1945), pp. 6, illus. 1).—During the year ended June 30, 1944, 668 samples of commercial inoculating material for legumes from 10 laboratories and secured mostly by purchase in the open market were tested in the greenhouse and the results obtained therefrom reported.

## HORTICULTURE

Some effects of boron and manganese on the quality of beets and tomatoes, O. B. GUM, H. D. BROWN, and R. C. BURRELL. (Ohio State Univ.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 267-275, illus. 2).—Solution and gravel experiments, conducted in the greenhouse to determine the effects of deficiencies in boron or manganese on the quality of beets and tomatoes, revealed that only a very small amount of these elements is necessary to produce a satisfactory crop. In gravel cultures, there was sufficient contamination to provide enough of these trace elements to produce good growth.

In the beet a deficiency of B was shown in a dark-red color of the leaves, followed by the wilting and death of the stem apices. The harvested roots of the B-deficient beets showed cankers with necrotic areas as compared with smooth, clean roots in the controls.

In the tomato, the B-deficient plants were smaller in the early stages, and just prior to fruiting the stems became very brittle. The leaves toward the top of the plants become brown along their edges and frequently the veins assumed a pinkish tinge. The fruits showed brown necrotic spots near the stem ends and the affected fruits did not develop a normal red color.

Mn deficiency symptoms were not so easily produced. In fact no well-defined symptoms were seen in tomato foliage from plants grown in large solution culture beds. However, when tomatoes were grown in 4-l. beakers, the leaves toward the top of the plant showed a yellowing of the tissue between the veins.

Neither B nor Mn deficiency had any very marked effect on the amount of alcohol-soluble nitrogen in tomato fruits. There was some decrease in the insoluble N. On the other hand, in the beet, there was with both B and Mn deficiency a marked increase in both alcohol-soluble and insoluble N in the roots. No nitrates were found in the B-deficient beets and considerable in the controls. The amounts of reducing and total sugars were less in both B- and Mn-deficient tomato fruits than in the controls. In the beet, this held true only for total sugars.

Mn deficiency produced no consistent effects on the ascorbic acid content of tomato leaves or fruit, but B deficiency did tend to lower the ascorbic acid content of beet leaves. There was much less carotene in beet leaves showing effects of B deficiency than in normal appearing leaves on the same plant. The amount of B found in the foliage varied directly with the amount available to the plants. In the case of the tomato, the amount of Mn found in the plant varied directly with that contained in the medium in which the plants were grown, but the Mn content of beet or tomato foliage must be extremely low before manifestations of deficiency occur. Taste tests failed to show any consistent difference in tomatoes grown with different levels of Mn.

A germination inhibitor in the seed coats of certain varieties of cabbage, L. G. COX, H. M. MUNGER, and E. A. SMITH. (Cornell Univ.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 289-294).—Freshly harvested seed of certain cabbage selections exhibited a pronounced dormancy and uneven germination. Comparisons were made between excised embryos, intact seed, and seeds with split seed coats. The excised embryos germinated readily, while the intact seed and the split seeds both displayed some delay. In another experiment where the seed coats were removed the seed germinated readily, all of which led to the deduction that some substance in the seed coat was hindering germination. This was further shown by treating seed with the water-soluble fraction of an alcoholic extract of powdered seed coats. Germination was definitely retarded. A practical method of breaking dormancy in cabbage seed by treatment with concentrated sulfuric acid for 1 min. and then washing in tap water is suggested.

Commercial cabbage culture, V. R. BOSWELL (*U. S. Dept. Agr. Cir.* 252, rev. (1945), pp. 60, illus. 21).—In this revision of an earlier publication (E. S. R., 69,

p. 51), general information is presented on the production of cabbage on a commercial basis including such items as effects of temperature on the young plants, characteristics of the more important varieties, value of good seed, preparation and fertilization of the soil, production of plants, control of disease and insect pests, harvesting and handling the crop, etc. Specific information applicable to cabbage production in different producing areas of the nation is offered.

**Some factors affecting production of market or garden peas,** W. C. BURNES and C. N. CLAYTON (*South Carolina Sta. Bul.* 354 (1945), pp. 15, illus. 1).—Treatment of pea seeds with certain proprietary materials resulted in significant increases in yield as compared with no treatment and, because of the moderate cost, such treatments are recommended as an inexpensive insurance against poor stands. Application of fertilizer in bands on each side of the seed caused a highly significant increase in yield over that obtained by mixing the fertilizer in the row. As to amount, 600 lb. of a 5-10-5 mixture per acre gave as good yields as did 1000 lb.

Mixing fertilizer in the row 8 days before planting caused some reduction in stand, but was not as deleterious as mixing in the row at time of planting. Of 8 different fertilizer mixtures applied at the rate of 640 lb. per acre, none proved more effective than the others when evaluated statistically. The authors suggest that the fertilizer application for peas be 600 to 800 lb. per acre of a 5-10-5 or 4-12-4 analysis.

Variety trials favored the Laxton Progress pea, which was the earliest ripening of all the wrinkled seeded, large-podded varieties. Laxton Progress produced usually one good picking before Hundredsold, Gradus, or Laxtonian came into production. Home gardeners may also use a late variety such as Morse Market to extend the period of production.

In rate of seeding tests with Laxton Progress, increased yields were recorded with increases in rate of seeding up to 1.5 bu. per acre. The use of more than 1.5 bu. of seed gave no significant increase and did add materially to the cost of production. Observations suggested that Laxton Progress should be sown between January 5 and 15 in the coastal areas and between January 15 and 25 in the Holly Hill and Lake City areas.

With seeds planted 1-, 2-, and 4-in. deep there was some delay in germination of the 4-in. seed, leading to a recommendation that pea seed be planted from 1 to 2 in. deep.

**Methods, rates of applying nitrogen for tomatoes,** E. L. MOORE (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 3, p. 5).—Results of 2 years' investigations show that early applications of nitrogen fertilizers are more effective in increasing tomato yields than are the same total amounts applied in split applications early and midseason. An early application of 200 lb. of nitrate of soda per acre produced an average over the 2 yr. of 122.2 field boxes of marketable tomatoes, as compared with 126.6 boxes for the 300-lb. treatment. Other nitrogen materials such as sulfate of ammonia and ammonia liquor did not give as favorable results as did the nitrate of soda.

**Experiments in growing tomatoes for canning,** J. BUSHNELL (*Ohio Sta. Bul.* 657 (1945), pp. 20+, illus. 2).—Field experiments conducted from 1941 to 1944 at the Northwest Test Farm located near Holgate yielded valuable information as to cultural requirements of the tomato. Fall plowing proved more effective than spring plowing, with a 3-yr. average of 9.93 and 7.95 tons of marketable tomatoes on the fall and spring plowed areas, respectively. Nitrogen fertilizer (cyanamid) plowed down gave increases in yield averaging 2 tons per acre. Fertilizers in the water applied at transplanting gave small but consistent increases in yield. Spraying with a copper fungicide controlled foliage diseases. The combination of fall plowing, adequate fertilizer, and application of a fungicide resulted in yields averaging over 10 tons per acre, about 4 tons above the State average. As to varieties, Indiana

Baltimore ripened fruits about a week earlier than Rutgers and averaged 11.7 tons of salable tomatoes per acre compared with 10.5 tons for Rutgers. Rutgers was slightly superior with respect to size and grade of fruits, so both varieties are recommended for planting.

Seasonal conditions were found important in determining yields, as in the rainy season of 1943 the best treatments gave yields of only 6 tons per acre.

**Young orchards: Planning, planting, and management,** T. J. TALBERT (*Missouri Sta. Bul. 299 (1945)*, pp. 24, illus. 9).—This contains general information as to planting stock, time of planting, preparation and handling of the soil, selection of varieties, pollination requirements, methods of planting, early training, use of fertilizers, care of the young orchards, pruning, spraying, protection from rodents and insects, etc.

**Treatment for rodent-injured fruit trees,** C. W. ELLENWOOD (*Ohio Sta. Bim. Bul. 233 (1945)*, pp. 41-43, illus. 2).—The author outlines briefly precautions, such as wire cylinders and veneer wrappings, that may be used to protect fruit trees from rabbits and describes bridge grafting methods that may be used to save trees that have been girdled.

**Spraying program and pest control for fruit crops** (*Ohio Sta. Bul. 655 (1945)*, pp. 64+, illus. about 47).—A revision of an earlier Bulletin 599 (E. S. R., 81 p. 515), this presents in a similar manner spray programs for various deciduous fruits; information regarding the nature, preparation, and use of spray materials; methods of spraying; spraying and dusting equipment; methods other than spraying for combating fire blight, peach canker, codling moth, borers, etc.; rodent control; etc.

**Some physiological responses of deciduous fruit trees to petroleum oil sprays,** G. D. OBERLE, G. W. PEARCE, P. J. CHAPMAN, and A. W. AVENS. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc. 45 (1944)*, pp. 119-130, illus. 2).—The application of dormant petroleum oil sprays of varying oil content on apple trees retarded the development of the new growth. The respiratory activity of the treated tissues was found less than that of the control trees. The addition of a dinitro material to the oil spray retarded development also, but produced pronounced increases in the rate of respiration of the trees immediately after spraying. Sprays of an acid nature, which carry the dinitro material predominantly in the oil phase of the emulsion, were found to be more toxic to plant tissue than were neutral or alkaline sprays. The effect of the dinitro sprays was found to be of short duration, since the material is readily removed by rains. The lateral buds and adjacent tissues of trees receiving oil sprays of recommended maximum concentrations contained large quantities of oil, which were believed responsible for the retarded development and decreased respiration noted.

**The effect of certain sprays upon the apparent photosynthetic activity of apple leaves,** E. L. OVERHOLSER, D. F. ALLMENDINGER, and F. L. OVERLEY (*Washington Sta. Bul. 447 (1945)*, pp. 28).—In an effort to determine the effect of different spray materials and spray schedules on the growth and functioning of the foliage of apple trees, the carbon dioxide ( $\text{CO}_2$ ) intake of leaves was measured with a modification of the apparatus described by Heinicke and Hoffman (E. S. R., 68, p. 744). The use of medium and light-medium oils throughout the season for control of codling moth tended to reduce the apparent  $\text{CO}_2$  intake. The use of light mineral oil with first brood codling moth sprays involving lead arsenate and nicotine sulfate, or lead arsenate and calcium arsenate, or lead arsenate or modified dynamite, followed in each case by fluorine second brood sprays did not reduce  $\text{CO}_2$  intake of apple leaves. In fact the use of light mineral oil and lead arsenate throughout the season did not significantly lower  $\text{CO}_2$  intake.

The use of either lead arsenate or calcium arsenate dynamite combinations, even when followed by second brood fluorine sprays, reduced the  $\text{CO}_2$  intake of apple

leaves. Herring oil, 1 pt. per 100 gal., tended to be less injurious than medium (65–75 viscosity) and light-medium (60–65 viscosity) mineral oils at concentrations of  $\frac{1}{2}$  to 1 gal. per 100 gal. used commercially. Calcium arsenate with mineral oil was less likely to reduce  $\text{CO}_2$  intake than was lead arsenate with mineral oil. Calcium arsenate when used with safeners such as zinc sulfate and calcium hydrate did not materially affect the  $\text{CO}_2$  intake. Oils and nicotine sulfate had a greater reducing effect than oils with calcium arsenate, lead arsenate, or bentonite.

**Relation of spray materials to russetting of Delicious and Golden Delicious apples,** D. H. PALMITER. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 113–118, illus. 1).—Observations in commercial orchards and experimental plots indicate that part of the severe russet which occurred on Golden Delicious and almost all of that on Delicious in 1943 was the result of spray injury. Rainy conditions made it necessary to spray while the trees were wet, and under such conditions russet injury was more severe than in drier seasons. In the case of unsprayed Delicious trees, no russetting occurred irrespective of position in the orchard. In contrast practically every sprayed orchard showed considerable russet where sprays had been applied under wet conditions. Arsenate of lead sprays caused almost as much russetting of Golden Delicious as did the wettable sulfur and arsenical combination. In 1943 the critical period for russet injury appeared to be from the pink stage until 2 or more weeks after petal fall, which is also the most critical period for disease development in the Hudson River Valley.

**Injury to Williams apples resulting from fumigation with methyl bromide,** A. L. KENWORTHY. (Univ. Del.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 141–145, illus. 3).—During 1944, 36 cars of Williams apples were fumigated with methyl bromide and shipped from Delaware. Apples from these shipments were rejected in midwestern markets because of internal discoloration and surface scald. Nonfumigated Williams and fumigated Starr, Yellow Transparent, and Wealthy apples were not injured, giving evidence that certain varieties are subject to methyl bromide injury and others are not.

An experiment, conducted under controlled conditions, included Williams, Starr, and Wealthy apples and Golden Jubilee peaches. Again the Williams apples were severely injured by methyl bromide treatment, while the other fruits showed no damage. The higher the temperature of the fruit at the time of fumigation, the greater was the injury to the Williams apples. The type of injury is described and illustrated.

**Pre-storage carbon dioxide treatments for control of apple scald,** S. A. PIENIAZEK. (R. I. Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 313–314).—Rhode Island Greening apples picked September 1 and 21, 1944, were exposed for 3-, 6-, and 10-day periods to rather concentrated atmospheres of carbon dioxide immediately after picking or after a month of storage. After storage at 32° F. until January 28, 1945, the fruits were removed and placed in a warm room at 65°–70°. The untreated fruits picked September 1 and September 21 developed 78 and 50 percent of scald, respectively. Fruits picked September 1 and treated with 30 or 60 percent  $\text{CO}_2$  for 3, 6, or 10 days showed no scald. Fruits of the September 1 harvest treated after 1 mo. of storage showed 6 to 24 percent of scald. Fruit of the September 21 harvest showed 0 to 20 percent scald in the immediate and delayed  $\text{CO}_2$  treatments.

The treated fruits were of desirable flavor and were firmer and less mature than the untreated.

**A study of the skin structure of Golden Delicious apples,** A. MEYER. (Univ. Tenn.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 105–110, illus. 11).—Seeking an explanation of the cause of excessive shriveling of the Golden Delicious apple,

the author studied the structure of the skin from the time of petal fall to maturity, using as comparison the Winesap apple. The skin of the Golden Delicious develops much the same as that of any other variety until about the middle of May when the young apples are about  $\frac{5}{8}$  of an inch in diameter. The epidermis then undergoes considerable periclinal division and from that time on is very irregular, with an unevenness of the cuticle. About July 1, when fruits were about 2 in. in diameter, cracks become evident in the cuticle and enlarge from then on as the apples increase in size. Winesap skin goes through a similar development except that the cuticle cracks rarely. Many of the cracks in the Golden Delicious cuticle reach the epidermis and hypodermis, yet remain unprotected by cork or other tissue. Apparently these unhealed cracks in the cuticle account for the excessive shriveling of the Golden Delicious apple in storage.

**Number and weight of apples in bushel basket,** C. W. ELLENWOOD and T. E. FOWLER (*Ohio Sta. Bimo. Bul.* 233 (1945), p. 44).—Records, taken during the packaging of Jonathan, Delicious, Baldwin, and Stayman apples, are presented to show the relation of size of apples to number and weight in standard U. S. bushel baskets. The larger the apples, the fewer the number per basket, but there were no substantial differences in weight of packed baskets.

**The rooting habit of Grimes apple trees under different systems of soil management,** C. E. BAKER. (*Ind. Expt. Sta.*) (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 167-172).—An examination of the root systems of 21-year-old Grimes Golden apple trees, four each from strawy manure mulch, cultivation, and blue-grass sod plots showed a wide variation in the root distribution between trees of a single treatment, the differences between trees in a given treatment being sometimes larger than from trees of different treatments.

Roots of trees in all treatments were confined primarily to the upper 24 in. of soil. A few medium-sized roots were found in the 24-36 in. depth in all 12 trees.

Determinations of the soil reaction showed that annual applications of ammonium sulfate had exerted little influence on soil acidity below the B-1 horizon, the area of silt accumulation resulting from leaching. There was no correlation between the weight of roots found in the trenches and the yield of the trees over a 9-year period. In fact the mulched tree with the greatest weight of roots had the lowest total yield of any of the four mulched trees. No correlations were established between any of the three systems of soil management and root development.

**The identification of pear varieties from non-bearing trees,** L. SOUTHWICK, A. F. FRENCH, and O. C. ROBERTS (*Massachusetts Sta. Bul.* 421 (1944), pp. 51, illus. 20).—The purpose of this bulletin, the sixth (E. S. R., 91, p. 547) in a series on the nursery identification of fruit varieties, is to show how young, nonbearing pear trees may be distinguished by various growth and foliage characteristics. By description and illustration, the outstanding characteristics of a large number of pear varieties are set forth in detail with the admonition that close study of the actual trees will be necessary before one can positively identify varieties and separate mixtures in the nursery row. Among important characters used are the habit of growth of the tree, the diameter and direction of the shoots, the lenticels and pubescence on the shoots, the color of the bark, the size and shape of the leaves, the curvature and serration of the leaves, and the glossiness or dullness of the leaves.

**Peach varieties in Mississippi,** L. R. FARISH (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 3, p. 6, illus. 1).—Records taken on a group of 36 varieties which fruited at the Delta Branch Station in 1944 showed Redhaven, Halehaven, Belle, Early Elberta, and Elberta to be particularly promising for the area. Varieties ripening after Elberta are too subject to insect and disease injury.

**A method for determining the relative cold hardiness of dormant peach fruit buds**, E. M. MEADER, O. W. DAVIDSON, and M. A. BLAKE. (N. J. Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 70 (1945), No. 9, pp. 283-302, illus. 4).—This paper describes a freezing test found effective for determining the relative cold hardiness of fruit buds of different varieties of peaches. An electrically operated ice cream cabinet-type refrigerator equipped with a thermostat that permitted operation at temperatures as low as 30° F. was provided with a galvanized iron tank containing wire frames for holding test tubes and a vacuum-operated agitator for stirring the cooling medium. The tank was filled with an antifreeze solution which cooled more slowly than the surrounding air, thus providing a lag which gave the desired slow rate of cooling. For the tests the authors used uninjured and unbranched terminal twigs collected from the periphery of the tree. In the beginning eight peach varieties known to have wide differences in the hardiness of the fruit buds were used to ascertain the rate of cooling that would most clearly differentiate comparative hardiness. In the regular trials varieties of established responses to temperature changes were included as criteria.

In general it was found that direct controlled artificial freezing of dormant fruit buds provided a rapid and reliable method of estimating the relative cold hardiness of the buds of different peach varieties. With the apparatus as many as 50 samples could be frozen at one time. The data emphasized the importance of the rate of temperature fall in cold injury to peach fruit buds. When the rate of cooling was the same, a drop of 1° within the critical subzero temperature range caused a significant increase in injury to peach buds. With a very slow rate of cooling, peach buds withstood minimum temperatures below those that killed the same varieties in the orchard. The results of the trials suggested the advisability of testing the cold hardiness of a given variety two or more times during the dormant season.

**Montana Progressive strawberry: A yellows-resistant, everbearing variety developed during research on yellows**, H. E. MORRIS and M. M. AFANASIEV (*Montana Sta. Cir.* 181 (1945), pp. 2).—A brief account is presented of a new yellows-resistant, everbearing strawberry developed by the station as a seedling from the Progressive variety.

**Breeding raspberries for North Carolina**, C. F. WILLIAMS (*Res. and Farming [North Carolina Sta.]*, 3 (1945), *Prog. Rpt.* 2, pp. 9, 12, illus. 2).—A brief account is presented of the extensive raspberry breeding project conducted by the station in which plant materials collected from all over the world have been crossed with horticultural varieties in an attempt to develop vigorous, productive, good-quality kinds for North Carolina. Vigor is easily obtained in the first generation, but backcrossing to the good-quality parents is necessary to obtain good quality in the seedlings. Promising results have been obtained.

**Seasonal changes in Florida grapefruit**, P. L. HARDING and D. F. FISHER (*U. S. Dept. Agr., Tech. Bul.* 886 (1945), pp. 100, illus. approx. 23).—Over a period of four crop seasons analyses were made of grapefruit grown on different rootstocks and in one case sprayed with arsenate of lead. The principal varieties studied were the seedy Duncan, the seedless Marsh, the pink-fleshed, seedy Foster, and the pink-fleshed, seedless Thompson.

The average weight of the fruits increased with maturity. Increase in size was also associated with development, but the rate of size increase decreased as maturity approached. There was a gradual lowering of the concentration of ascorbic acid in the fruit as it ripened, but the total ascorbic acid per fruit tended to increase as the volume of the juice increased with advancing maturity. The total ash content of the juice was generally highest in immature fruits. The ash content of the flesh showed a greater content of potassium in Duncan than in Marsh grapefruit. Analyses

also showed a greater content of Ca and Mg and in some cases of K in fruits harvested in November as they approached legal maturity than the next May when the fruit was very mature. However, the greatest amounts of Mn were found in the very ripe fruits. Content of Fe varied considerably without any definite trend. Pectic materials decreased usually with ripening, protopectin being more consistent in this respect than soluble pectin.

During the commercial picking season the acidity of the juice decreased gradually with ripening. In April and May acidity decreased abruptly in very ripe fruit. Reducing sugars increased with the ripening of the fruit. Sucrose increased usually during the fall months, remained fairly constant during midseason, and decreased sharply between February and April.

Total solids or total soluble solids (principally sugars) were generally highest when the grapefruit was in prime eating condition. As to effect of rootstock, Marsh and Duncan on sour orange contained more total solids than fruit of trees on rough lemon. On a given stock, Duncan was higher in total solids than was Marsh. Although total acid was influenced more by variety than rootstock, the fruit on sour orange rootstocks was rather consistently higher in total acid than that on rough lemon.

One spray of lead arsenate caused a significant reduction in total acid. The total acid of immature sprayed fruit was some 4 to 9 percent lower than that of unsprayed fruit of comparable maturity. In very ripe sprayed fruit the difference was as much as 21 to 26 percent. Lead arsenate spraying tended thus to hasten to legal maturity of grapefruit. On the other lead arsenate sprays tended to decrease the weight and size slightly. There was no affect on concentration of ascorbic acid or total solids in the juice.

**Bananas in wartime**, G. BURMEISTER (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 4, pp. 63-66, 74-75, illus. 4).—The author discusses the present shortage of bananas, the normal picture as to areas and extent of production, introduction of the banana to the Americas, varieties, culture, handling the crop, transportation facilities, etc.

**Brazilian coffee goes to market**, H. W. SPIELMAN (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 5, pp. 83-85, 95, illus. 4).—This paper discusses coffee production from the viewpoint of the plantation operations and includes information on methods of planting, cultural management, pruning, harvesting and processing, marketing, etc.

## FORESTRY

**The work of the U. S. Forest Service** (*U. S. Dept. Agr., Misc. Pub. 290, rev. (1945)*, pp. 32, illus. about 15).—This revision of the earlier publication (E. S. R., 79, p. 199) discusses in a like manner the function and activities of the Forest Service in administering the national forests, in cooperating with States and private timber owners, in conducting research on forest and range management, utilization of forest products, etc.

**Watershed protection, recreation, wildlife, range use on the forest lands** (*Idaho Sta. Cir. 101 (1945)*, pp. 7).—Stating that over two-fifths of Idaho is forested, this circular discusses the importance of the forested area in timber production, watershed protection, forest recreation, and habitat for desirable wildlife and for domestic livestock. A suggested program for the maintenance and development of the forest resources in the postwar period is outlined.

**North Carolina forest growth and drain 1937-43**, J. W. CRUIKSHANK and A. D. TOLER (*U. S. Dept. Agr., Forest Serv., Appalachian Forest Expt. Sta., Forestry Survey Release 18 (1945)*, pp. 36+, illus. 7).—In the 7 yr. 1937-43 pine saw timber decreased 2 percent in volume, cypress decreased 9 percent, and hardwood

increased 1 percent. The average annual net growth of saw timber for the 7 yr. has been 2.3 billion bd. ft., 1.7 of softwoods and 0.6 of hardwoods. The total sound-tree growing stock increased at an average annual rate of 9.3 million cords, 5.7 of softwoods and 3.6 of hardwoods. Over the 7 yr., drain from saw timber has averaged 2.4 billion bd. ft. per year, of which 1.8 billion was softwoods. In the 3 war years saw timber drain was 15 percent greater than in the 4 preceding years, and the total drain of all sound trees was 12 percent greater. The hardwood saw timber decreased nearly 5 percent in 7 yr. in the mountains but elsewhere in the State it increased. In the piedmont area, pine saw timber decreased 16 percent and hardwoods now make up 45 percent of the total stand as compared with 40 percent in 1937. Trends suggest an increase in volume of low quality hardwoods, a reduction in the average size of the saw timber, and a growing scarcity of operable saw-timber stands of good quality.

**Shelterbelt influences.**—I, General description of studies made. II, The value of shelterbelts in house-heating, C. G. BATES. (U. S. D. A. coop. Univ. Minn.). (*Jour. Forestry*, 43 (1945), Nos. 2, pp. 88-92; 3, pp. 176-196, illus. 4).—This paper discusses the status and results of studies made in the Great Plains region during the period 1935 to 1938. Estimates based on a survey in 1935 had indicated that a good belt of trees protecting the farm home would reduce the fuel bill by about 25 percent. The experimental data showed that this estimate was well within the limits obtainable by a good shelterbelt providing protection from northerly winds alone. When protection is provided against both north and west winds the saving may be substantially increased. A possible saving of 40 percent fuel is forecast when the home is set in the center of a grove or forest. These facts are presented with a view to encouraging farm owners in preserving their shelterbelts during the present shortage of fuel. It is suggested that only dead wood be utilized for fuel.

## DISEASES OF PLANTS

The Plant Disease Reporter [March 15 and 22, April 1 and 7, 1945] (U. S. Dept. Agr., *Plant Disease Rptr.*, 29 (1945), Nos. 9, pp. 221-245, illus. 4; 10, pp. 247-272; 11, pp. 273-300; 12, pp. 301-326).—In addition to brief notes from the Emergency Plant Disease Prevention Project relating to cereals and grasses, field legumes, potatoes, sweetpotatoes, and vegetables (including storage troubles), tobacco, ornamentals, nursery stock in storage and miscellaneous plants, the above issues contain the following signed notes and articles:

No. 9.—Host-parasite check list revision, *Hordeum-Koelcira* (Gramineae), by F. Weiss; immaturity and spoilage in the Iowa 1944 corn crop, by E. F. Vestal; late blight of potatoes and tomatoes in the Lower Rio Grande Valley of Texas, by G. E. Altstatt; further report on vegetable diseases in northern New Jersey, by A. J. Mix; winter truck crop diseases in the eastern Carolinas, by A. E. Prince; and sweet-potato soil rot slip treatment and varietal reaction tests in Texas, by R. D. Watson (Tex. Expt. Sta.).

No. 10.—Diseases of seed cauliflower in California, by W. C. Snyder and K. F. Baker (Univ. Calif.); sweetpotato storage diseases in east Texas, by R. D. Watson; storage diseases of apples in Virginia and West Virginia, by R. E. Atkinson; and initial infections of tobacco blue mold on old and new beds in South Carolina, by A. E. Prince.

No. 11.—Host-parasite check list revision, *Lagurus-Oplismenus* (Gramineae), by F. Weiss; moisture content and development of molds in corn stored under various conditions in three eastern Nebraska counties during the winter of 1944-45, by C. M. Slagg, J. E. Livingston, and J. C. Swinbank (Nebr. Expt. Sta. et al.); incidence of crown rust of oats from October to March, 1944-45, in Arkansas, by H. R. Rosen

(Ark. Expt. Sta.) ; early spring incidence of cereal diseases in Arkansas, by H. W. Larsh; and preliminary note on the use of dithiocarbamates as soil treatments for the control of soil-borne diseases, by J. W. Heuberger (Del. Expt. Sta.).

No. 12.—Eelgrass conditions along the Atlantic seaboard of North America, by C. Cottam; notes on diseases of tobacco observed in Puerto Rico during the 1944-45 season, by A. Goenaga; aster yellows and its insect vector in Texas, by R. D. Watson; and early spring incidence of cereal diseases in Oklahoma, by H. W. Larsh.

[*Phytopathological papers*] (*Fla. State Hort. Soc. Proc.*, 56 (1943), pp. 22-26, 31-43, 49-55, 126-128, illus. 16).—The following are of interest: Green-Spotting in Relation to Time of Day That Early Oranges Are Harvested, by E. V. Miller and J. R. Winston (pp. 22-26), Decay Control in Florida Lemons, by J. R. Winston and G. A. Meckstroth (pp. 31-37), and Studies of Boron Deficiency in Grapefruit, by W. R. Roy (pp. 38-43) (all U. S. D. A.); and A Comparison of Some Copper Fungicides in Controlling Citrus Melanose, by R. K. Voorhees (pp. 49-55), and A New Disease [*Diaporthe citri* and *Diplodia nataleensis*] of Persian (Tahiti) Lime Transmitted Through Budwood, by G. D. Ruehle (pp. 126-128) (both *Fla. Expt. Sta.*).

[*Plant diseases and their control*] (*Jour. N. H. Hort. Soc.*, 8 (1945), pp. 65-78, 86-88).—The following are included: Mineral Nutrition and Apple Leaf Scorch in New Hampshire, by L. P. Latimer (pp. 65-69) (N. H. Expt. Sta.); Development of the Newer Fungicides (pp. 69-71) and Developing New Fungicides (pp. 71-78), both by J. G. Horsfall (Conn. [New Haven] Sta.); and Spraying Tomatoes To Improve Yield and Quality, by M. C. Richards (pp. 86-88) (Univ. N. H.).

Notas fitopatologicas, 1. agregado a la lista de "Enfermedades y plagas principales de la agricultura Uruguaya" [Phytopathological notes: Addition to the list of "Principal Diseases and Plagues of Crop Plants in Uruguay"], J. C. BERTELLI and L. KOCH DE BERTELLI ([Uruguay] *Dir. Agron., Notas Fitopatol.* 70 (1944), pp. 25+, illus. 15).—Some 16 bacterial, fungus, and virus diseases are reported as new to the country during the past 2 yr.; each is considered briefly, including its symptoms, a description of the causal organism, its local distribution, and its control. This supplements the contribution noted (E. S. R., 86, p. 636).

Observations on the genus *Catenaria*, J. N. COUCH (*Mycologia*, 37 (1945), No. 2, pp. 163-193, illus. 78).—A fungus with a thallus similar to *C. anguillulae* and resting bodies germinating as in *Blastocladiella cystogena* was isolated from soil with its host fungus *Allomyces anomalus*. Growth tests indicated it to be an obligate parasite on *Allomyces* spp. and *B. simplex*. It failed, however, to grow on *B. cystogena*, *B. laevisperma*, or *B. aperosperma*, or on *Blastocladia parva*, *Achlya* sp., or *Saprolegnia* sp. Infection stages on *Allomyces anomalus*, the development of the thallus, zoosporangia, resting bodies, and fusion of motile gametes are described, and the fungus is named *C. allomycis* n. sp. *C. anguillulae* was isolated from Texas soil and grown in pure culture on a variety of agars for the first time; its culture characters and life history stages are described. The resting bodies are formed and germinate much as in *Blastocladiella*. On the basis of zoospore structure, method of discharge, and swimming and resting body structure and germination, the genus *Catenaria* is transferred from the Chytridiales to the order Blastocladiales, and the subfamily Catenarioideae is raised to family rank. The species *C. allomycis* exhibits a parallel in its life history to *A. cystogenum*, whereas the life cycle of *C. anguillulae* is similar to that of *A. anomalus*.

Descriptions of tropical rusts, VII, G. B. CUMMINS. (Ind. Expt. Sta.). (*Bul. Torrey Bot. Club*, 72 (1945), No. 2, pp. 205-222, illus. 9).—Of the 49 rust-fungus species here considered (E. S. R., 90, p. 457), 24 involve new taxonomy.

Reducing losses from diseases and pests, H. P. BARSS and F. ANDRE (U. S. Dept. Agr., Off. Expt. Stas., 1945, pp. 16+).—This reprint (E. S. R., 92, p. 870)

summarizes some of the recent progress of the State agricultural experiment stations on new and improved fungicides and more efficient insecticides. It is supplemented by a report previously noted (E. S. R., 93, p. 41).

**Symposium on new developments in fungicides** (*U. S. Dept. Agr., Plant Disease Rptr.*, 1945, Sup. 157, pp. 147-166).—The following papers, with discussion, are included: Quaternary Ammonium Derivatives, by F. L. Howard; Dithiocarbamic Acid Derivatives as Fungicides and Insecticides, by J. W. Heuberger; and Synergism and Antagonism, by J. G. Horsfall.

**An evaluation of seed treatment materials**, A. N. BROOKS. (*Fla. Expt. Sta.*) (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 186-188).—On Semesan, Cuprocide, zinc oxide, copper carbonate, Barbak C, Arasan, and Spergon.

**New fungicides for potatoes and tomatoes**, G. D. RUEHLE. (*Fla. Expt. Sta.*) (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 201-206).—Included in the tests reported were He 175, Copper-hydro 40, Cuprocide, Copper Compound A, organic fungicide No. 604, Thiosan, Spergon, and Fermate, with some of them in various combinations of  $ZnSO_4$ ,  $CuSO_4$ , lime, etc.

**A cytologic study of several smut fungi**, E. HIRSCHHORN. (*Wash. Expt. Sta.*) (*Mycologia*, 37 (1945), No. 2, pp. 217-235, illus. 4).—In spite of the fact that from the biologic and economic points of view the Ustilaginales constitute one of the most important groups of parasitic fungi in the world, not much has been done to explain the biological phenomena associated with the behavior of their nuclei, most previous studies having dealt with the taxonomy, life history, and physiology of members of the group. The detailed results are here presented of studies on the cytology of *Ustilago williamsii*, *U. spegazzinii agrestis*, *U. halophila*, and *Sorosporium consanguineum*. There are 18 references.

**A critical study of some species of Ustilago causing stem smut on various grasses**, G. W. FISCHER and E. HIRSCHHORN. (*Wash. Expt. Sta. coop. U. S. D. A.*) (*Mycologia*, 37 (1945), No. 2, pp. 236-266, illus. 6).—During the course of a monographic study of the stem smuts of *Stipa* and *Oryzopsis* in North America, it was discovered that *U. hypodytes* has for many years been applied to a complex rather than to a single species of smut fungi. The purpose of this paper is to present the results of a critical analysis of this complex, based on studies of hundreds of herbarium specimens from North and South America, Europe, Asia, and Africa, most of which had been "identified as *U. hypodytes* by many prominent mycologists and issued as authentic exsiccati." Recent collections by the authors from North and South America are also included. There are 22 references.

**The stem smuts of *Stipa* and *Oryzopsis* in North America**, G. W. FISCHER. (*U. S. D. A. coop. Wash. Expt. Sta.*) (*Butler Univ. Bot. Studies*, 7 (1945), Papers 1-13, pp. 25-39, illus. 6).—Over much of the western range, comprising some 728 million acres, species of *Stipa* and *Oryzopsis* are prominent and important members of the grass cover. They are commonly found affected with stem smut, often as much as from 15 to 20 and occasionally as much as 90 percent of the plants being infected. This paper represents a taxonomic treatise on the six known species and one variety causing stem smut of these two grass genera in North America. A key for identification and a discussion of the comparative histology of these fungi are included.

**Cereal diseases, their recognition and control**, W. C. MOORE ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul.* 129 (1945), pp. 42+, illus. 18).—This compendium contains short general accounts of the diseases of cereals occurring in Great Britain—the rusts, smuts, leaf stripe and allied diseases, foot and root rots, miscellaneous diseases, bacterial diseases, virus diseases, and nonparasitic diseases, including frost injury, oats blast, deficiency diseases, and brown neck and loose ear of wheat. An index to hosts, diseases, and pathogens is provided.

**Effect of vernalization on the development of stripe in barley, E. ÅBERG.** (Univ. Wis. and U. S. D. A.). (*Phytopathology*, 35 (1945), No. 5, pp. 367-368).—During classification studies of North American varieties a winter barley nursery was grown in Idaho (1944), vernalized and nonvernalized seed being planted. It happened that some of the barley strains were infected with *Helminthosporium gramineum* and that the vernalization process favored the development of the stripe disease. It might thus be possible to develop a technic for testing varietal resistance to barley stripe on the basis of a vernalization procedure.

**The field inoculation of rye with Claviceps purpurea, R. W. LEWIS.** (Mich. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 5, pp. 353-360, illus. 1).—Rye plants were found to be successfully inoculated by spraying them during the blooming period with a heavy sugar-solution suspension of saprophytically grown spores. A suspension in a 50-percent commercial sucrose solution can be kept in cold storage for several weeks and then used for inoculation by diluting 1:15 with water just before spraying. The sugar-spore suspension possesses some of the properties of natural ergot honeydew: It protects spores from death by desiccation after application to the plants and thus maintains a high spore load through the susceptible period of the host; it attracts insects; it inhibits germination of spores when concentrated and then allows them to germinate when in contact with the pistils of rye flowers. Inoculation was successful with either a hand or power sprayer. On the latter, a special boom arrangement was constructed so that the rye heads were bunched as they passed under the cone of spray. With from 3 to 9 applications, from 30 to 60 percent of the heads became infected as compared with 3 to 10 percent in the controls.

**Reacción de algunos trigos con respecto a las razas fisiológicas de Puccinia rubigo-vera tritici, comunes en Argentina [Reaction of some wheats to physiological races of leaf rust], J. VALLEGA (Buenos Aires Univ., Rev. Facult. Agron. y Vet., 11 (1944), No. 1, pp. 91-115, illus. 1; Eng., Portug. abs., pp. 112-113).**—None of the wheat varieties at present cultivated in Argentina is immune to all physiologic races found there. Sinvalocho is said to be least attacked because of its resistance to races 20 and 49, which are the most abundant. Several other varieties are reported to be resistant or only moderately susceptible to nearly all races present and are usually only lightly rusted; nevertheless, the reactions of these varieties are variable and under certain conditions they prove very susceptible. The main sources of the resistant factors in Argentina wheat varieties are listed, together with the races to which each is resistant. A new selection—Progreso × Apulia H 211 t 140—proved resistant to all races known in Argentina. Wheats from other countries resistant to one or more races and those exhibiting an intermediate reaction to nearly all races are listed. Analyses of forms of different species of *Triticum* indicated all belonging to *T. monococcum* and *T. timopheevii* to be resistant; on the other hand, forms of *T. spelta*, *T. macha*, *T. sphaerococcum*, *T. durum*, *T. dicoccum*, *T. turgidum*, *T. polonicum*, *T. persicum*, and *T. pyramidale* exhibited varying reactions.

**A third factor for resistance to Puccinia graminis tritici, I. A. WATSON and W. L. WATERHOUSE (Nature [London], 155 (1945), No. 3929, p. 205).**—A brief statement on a third factor for resistance to race 34 found by the authors in the Kenya varieties of wheat.

**Varietal resistance and susceptibility of wheat to flag smut (*Urocystis tritici* Köern.).—IV, Further studies on physiologic specialization in *Urocystis tritici* Köern., T. F. YU, H. R. WANG, and C. T. FANG (Phytopathology, 35 (1945), No. 5, pp. 332-338).**—Five previously reported races of *U. tritici* together with 37 additional smut collections were tested for their virulence on 17 varieties of common wheat; 6 new smut races were identified from 21 of the 37 smut collections. In

addition, another physiological race found on a poulard wheat was tested. The 12 races were separated on the basis of differences in their pathogenicity on 4 varieties of common and 1 variety of poulard wheats; they have been assigned race numbers 1-12. Races 1-5—previously identified—still remain constant; races 6-12 are described as new. Races 4 and 5 produce intermediate reactions on Nanking No. 716, a well-known flag smut-resistant wheat in China. Race 12, collected on a poulard wheat, is the only race infecting a turgidum wheat. In Yunnan, 5 races have been identified; race 2 is conspicuously prevalent and widespread, occurring 4 times in 7 collections. Races 1-5 have proved stable in pathogenicity for 11 yr.

The prevalence of the wheat nematode in China and its control, V.-M. CHU (*Phytopathology*, 35 (1945), No. 5, pp. 288-295, illus. 1).—During the last 3 yr. comparative studies have been made of the methods used to control wheat nematode in China. Fanning was found practically useless, since treated seed yielded about the same percentage of galls as the controls. Screening provided good control but resulted in loss of some of the grain. The efficiency of the hot water treatment varied considerably; in some cases it reduced the percentage of infection to 0.01 percent, but in others as high as 4.3 percent of galls were found. Water flotation proved efficient, reducing the disease to 0.13 percent in contrast to 2.3 percent for untreated grain and also increasing the yield by 14 percent over that of the control plot. Salt brine sedimentation completely eliminated the galls in treated seed lots. If there were no need to consider the cost of salt, this would be one of the most effective control measures and would compare favorably with the mechanical separation method using the special wooden gall-separating machine. For the investigation period as a whole, the wheat-nematode eliminator machine has been the most effective and useful means for controlling the disease in China.

Elsinoë and sphaceloma diseases in Yunnan, China, particularly hyacinth bean scab and scab of castor bean, C. C. CHEO and A. E. JENKINS. (U. S. D. A. et al.). (*Phytopathology*, 35 (1945), No. 5, pp. 339-352, illus. 5).—Five diseases caused by *Elsinoë* and *Sphaceloma* were found by Cheo in Yunnan Province (1938-39). These were rose anthracnose, grape anthracnose, and sour orange scab, of which previous records elsewhere in China are assembled; the other two diseases—hyacinth bean scab and scab of castor-bean—are essentially new. The presence of hyacinth bean scab had been reported in Uganda, Africa, without description, by Hansford (1932-33); also part of the D. C. Edwards' specimen from Kenya Colony (1930) had been made available to the second author (1936). Similarly, Sawada had sent specimens of castor-bean scab from Formosa prior to the receipt of Cheo's specimens from Yunnan. Symptoms of these two diseases are delineated and their pathogens described, the organism from hyacinth bean as *E. dolichi* and that from castor-bean as *S. ricini*; diagnoses in Latin were made available in 1941 (E. S. R., 86, p. 202). Inoculations with cultures of *S. ricini* on four castor-bean varieties gave positive results, as did corresponding trials on hyacinth bean with *E. dolichi*. Only negative results were obtained in cross inoculations with *E. dolichi* on swordbean, jackbean, and lima bean. Parallel culture comparisons on Thaxter's potato agar included one culture each of *E. dolichi*, two other legume species (*E. phaseoli* on lima bean from Cuba and *S. arachidis* on peanut from São Paulo, Brazil), *S. ricini*, and *E. lanceitii*. The cultures were in all cases distinct.

Copper deficiency in the Busselton-Augusta District: A review of its history and investigation with special reference to the re-establishment of subterranean clover, L. T. JONES and H. G. ELLIOTT (*Jour. Dept. Agr. West. Austral.*, 2. ser., 21 (1944), No. 4, pp. 342-357, illus. 5).—It is now known that the crop, livestock, and pasture problems that baffled early investigators in these Australian areas were due to a deficiency of copper in the soil. Use of CuSO<sub>4</sub> (or its equivalent in Cu from other sources) on Cu-deficient land—usually at the rate of 10 lb.

per acre—has been followed by a quick regeneration of subterranean clover, an increase in the Cu content of the pasture with improved health and production of the stock grazed thereon, and an increase in the carrying capacity of these "stalled" areas.

**Effect of low temperatures on survival of Phymatotrichum omnivorum**, W. N. EZEKIEL. (Tex. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 5, pp. 296-301, illus. 1).—*P. omnivorum*—as vegetative growth on agar slants, in large sclerotial masses high on the walls of flask cultures, or as portions of sclerotial masses on agar slants or buried in moist soil—failed to survive exposure in the laboratory to  $-13^{\circ}$  C. for more than 24 hr.; at  $5^{\circ}$ , growth was prevented but there was no reduction in viability even after 50 days. The northern limit of natural occurrence of root rot corresponds, in general, with several summaries of recorded temperatures and particularly well with the line at which the lowest observed air temperatures reached  $-23^{\circ}$ . Coupled with the sensitivity to cold shown by the fungus in laboratory tests, this finding suggests that the northward distribution of phymatotrichum root rot has been limited by prevailing temperatures, and that the pathogen is unlikely to become established north of the present root-rot area.

**Iron deficiency chlorosis of flax**, C. R. MILLIKAN (*Jour. Dept. Agr. Victoria*, 43 (1945), No. 3, pp. 133-134, illus. 1).—The author reports on a yellowing disease in flax growing in a deep black self-mulching soil containing a high percentage of limestone. Sand and water cultures and pot experiments indicated that the chlorosis was due to an Fe deficiency; it was also observed that whereas a marked chlorosis developed in flax sown in winter, plants grown in the same pots during summer were free of the trouble. It thus seemed evident that there was an increased amount of Fe available during the summer months; this would explain the recovery shown by plants in the field during late spring and early summer. The chlorotic phase of the trouble was most severe in the wetter soils and at low soil temperatures.

**A new bacterial disease of the potato in Kenya**, R. M. NATTRASS (*East African Agr. Jour.*, 10 (1945), No. 3, pp. 162-163, illus. 4).—The symptoms of the "new bacterial disease" appeared identical with those of the ring rot due to *Corynebacterium sepedonicum*, but comparison with a culture of the latter showed the Kenya organism to differ.

**Fluorescence in ultra-violet light as a test for the presence of leaf roll virus in potato tubers**, J. A. ALLAN (*Nature [London]*, 155 (1945), No. 3926, p. 116).—From limited tests with tubers collected from leaf roll and normal plants during late July, it is concluded that "there appears to be every possibility that this test could be used with some degree of certainty in diagnosing the presence of the leaf roll virus in potato tubers, and the test has the advantage of being rapid."

**Treatment of potato refuse piles to prevent spread of late blight**, G. P. STEINBAUER (*Maine Sta. Bul.* 434 (1945), pp. 287-292+, illus. 3).—The importance of the refuse or cull pile as a source of infection early in the season has already been pointed out (E. S. R., 89, p. 326). This gives information on procedures designed to prevent spread of the disease from this source.

**A chlorosis of paddy (*Oryza sativa L.*) due to sulphate deficiency**, S. P. AIYAR (*Cur. Sci. [India]*, 14 (1945), No. 1, pp. 10-11).—This study indicated that the chlorotic rice plants described contained much less S than normal; they responded, however, to sulfate treatment, leading to maximum yields, a large increase in S content, and a correction of all the abnormalities originally present. It is thus concluded that the symptoms exhibited were caused by S deficiency and that added sulfate acted as a direct nutrient. Powdered S,  $\text{CaSO}_4$ ,  $\text{FeS}_2$ , or the usual sulfate-containing fertilizers proved equally effective, and an application rate of

10 lb. S per acre in any of these forms was sufficient to cure the trouble and produce the maximum yield for the soil used.

**Black rot of rutabagas**, J. K. RICHARDSON (*Sci. Agr.*, 25 (1945), No. 7, pp. 415-425, illus. 10).—This disease—caused by *Xanthomonas campestris*—is reported to have been on the increase in Ontario since 1939, resulting in serious losses. The rapidly expanding popularity of the Laurentian variety, necessitating use of fresh seed, may have had a considerable bearing on the situation. The symptoms are not easily confused with other leaf and root diseases, and the pathogen is seed-borne and readily isolated and cultured. Chemical seed disinfectants vary in their lethality on the fungus, HgCl<sub>2</sub> and Semesan having given the most satisfactory results. Infection may enter through the leaves or from the soil through the roots; under humid conditions its spread is very rapid. In 1943 striking reductions in the amount of black rot were observed in fields planted with disinfected seed; in 1944—when over 95 percent of the seed was disinfected—the disease was not economically important. Recommendations for control are outlined.

**Sugar beet diseases and their control in Montana**, H. E. MORRIS and M. M. AFANASIEV (*Montana Sta. Bul.* 427 (1945), pp. 22, illus. 18).—Sugar beets in Montana are said to have escaped serious damage from parasitic and physiological troubles for many years, but now certain of these diseases are becoming of great economic importance. It is the authors' purpose to describe these diseases in such a way that growers may recognize them and to offer recommendations for their satisfactory control.

**Comparison of various fungicides, diluents, and adhesives in controlling cercospora leaf spot of sugar beets**, J. D. WILSON and H. C. YOUNG (*Ohio Sta. Bimo. Bul.* 233 (1945), pp. 62-72).—This leaf spot had become a limiting factor for sugar beet production in Ohio by 1935; experimental work on its control over a period of several years is here summarized. Copper-containing spray and dust materials increased the yields by 3-6 tons per acre in the tests of 1938-40; yields were increased in some instances even when disease was scarce or where resistant strains were used. The sugar content and purity were also increased by disease control. Bordeaux and copper-lime dust were used until the late thirties, after which the fixed coppers came into rather general use in Ohio. Because of grower preference most of these were applied as dusts, even though spraying gave slightly better disease control. Since dusters capable of applying the low quantities needed were not available, diluents were added to give a mixture containing 7 percent of Cu as the metallic equivalent; this was applied at 30-60 lb. per acre. The effects of different Cu compounds, diluents, adhesives, and wetting agents and of varying the time, rate, and type of application were observed in a series of tests during 1938-43. Both crop yields in tons per acre and foliage condition were used in judging the efficiency of the various materials and practices.

In a series of 17 spraying and dusting tests over a 6-yr. period, the average yield increase was at least 20 percent over the untreated controls. In an average of five comparisons, spraying gave somewhat better disease control than dusting, but the dusted plots produced the larger yields. Night dusting proved somewhat more efficient than day dusting in both disease control and yield increase, though the differences were small. Bordeaux was more efficient in controlling leaf spot than six fixed coppers applied as sprays, but when all materials were applied as dusts some of the fixed coppers did as well as or better than copper-lime dust. The basic copper chlorides (Copper A and COC-S) gave slightly better results than the basic sulfates (Tribasic and Basicop), whereas one oxide (Cuproicide) was similar to the basic sulfates and another (brown cupric oxide hydrated) was inferior. In an average of 8 tests, application of 1.5 lb. of Cu (calculated as the metallic equivalent) per acre reduced the percentage of diseased foliage from 83

on untreated plots to 39 and increased the beet yield from 16.9 to 20.3 tons per acre. A further increase in Cu of approximately 1 lb. per acre further improved disease control and increased the yield.

A summary of all data on Cu application indicated that about 2.5 lb. per acre should be used; this corresponds to about 35 lb. of a 7 percent dust. A comparison of diluents in 5 tests indicated little preference so long as well-mixed dusts were properly applied at the same rates per acre. The talcs, however, gave slightly better results than clay, gypsum, and whiting in that order. The value of adhesives as a part of fixed-copper dust mixtures was not clearly demonstrated; this was also true for wetting agents. Use of S as a supplementary fungicide for the fixed coppers was not justified in the 1942 tests. Fermate and Dithane failed to control leaf spot or increase yields as efficiently as the fixed coppers in one experiment on muck-grown beets.

Certain symptoms resembling those of curly top or aster yellows, induced by saliva of *Xerophloea vanduzeei*, H. H. P. SEVERIN, F. D. HORN, and N. W. FRAZIER (*Hilgardia [California Sta.]*, 16 (1945), No. 7, pp. 335-360, illus. 9).—The eggs of this leafhopper were deposited in the petioles, midrib, and veins of sugar-beet leaves. One nymph passed through six molts; all others through five. Each instar is accurately determined by measuring the head across the compound eyes. The color of the first instar is gray; of the second, greenish gray; and of the third, fourth and fifth instars, green. The adults have four color forms—gray ♂♂ and green, pink and cream-colored ♀♀. The feeding of this insect on sugar beets induces cleared veinlets, previously considered a reliable symptom of curly top; on asters it induces cleared venation with yellow veinbending, stunting, development of axillary shoots from the bud in the axil of the leaves, and virescence of the flowers—all symptoms of aster yellows. Breaking in the color of the petals is the most striking effect of the feeding. Only failures resulted from inoculating the leaves, midrib, or petioles of healthy beet seedlings and asters, using carborundum or a flamed needle with a cotton swab near the point. When inoculations were made with a flamed needle in the crown between the bases of the petioles, the characteristic yellowing and necrosis of the outer leaves developed, but no symptoms appeared on the younger leaves. The salivary glands of each nymph that was crushed into a beet root by the flamed-needle method induced yellowing and necrosis on one or more outer leaves. Known vectors of curly top and aster yellows failed to transmit the causal agent from plants showing symptoms of *X. vanduzeei* injury to corresponding healthy plants. In both sugar beets and asters the active principle is systemic and presumed to be due to a toxic salivary secretion. The average time for symptoms to develop on asters was less for every instar than for the adult, and longer for three color forms of overwintering ♀♀. There are 41 references.

Effect of downy mildew on productivity of sugar beets, and selection for resistance, L. D. LEACH (*Hilgardia [California Sta.]*, 16 (1945), No. 7, pp. 317-334, illus. 4).—*Peronospora schachii* reduces the yields by retarding root growth, interfering with normal sugar production and lowering the purity of the beet. Plants showing infection of the growing point before 100 days of age produced roots about half as large as normal plants, but infection on those over 150 days old resulted in only slight reduction in size. The sucrose content and purity of infected beets harvested within 2 mo. after the end of a severe outbreak were considerably lower than those of healthy beets; when harvesting was delayed for 3 to 4 mo. after the end of an epidemic, the sucrose content and purity were nearly normal. The results of trials during 2 yr. indicated that infected beets produce from 30 to 40 percent less sugar than healthy beets growing in the same field. In 3 yr. comparisons of several commercial varieties grown on the Pacific coast,

U. S. 15, R. & G. AA, and one strain of R & G. Old Type proved most resistant. Among European varieties some strains or seed lots were apparently more susceptible than other strains of the same variety. No varieties were found with enough resistance to provide a satisfactory control. Seedlings of five commercial varieties growing in a greenhouse during the fall and winter were sprayed repeatedly with spore suspensions of the downy mildew fungus; after 95 to 98 percent had become infected, the remainder were transferred to isolation plots for seed production. Comparisons of the progeny of these selected seedlings with parental material showed that, in some lines, resistance had been considerably improved.

*Obtención de razas de tabaco resistentes al mosaico ordinario*, E. ALCARAZ MIRA ([Spain] *Bol. Inst. Nac. Invest. Agron.* No 11 (1944), pp 89-120, illus 18, Fr., Eng., Ger. abs., pp. 118-119).—By hybridization of the different tobaccos cultivated in Spain with the Ambalema variety, mosaic-resistant strains have been obtained and are described and discussed. The selection technic consisted of obtaining several generations without selection, artificially infecting them, and separating the seed of the resistant plants and hothouse production of auxiliary generations to ascertain the reactions of the descendants before carrying the selection any further. A description of the newest hybrids is also given.

**Organic fungicides and the control of vegetable diseases in Ohio**, J. D. WILSON (*Ohio Sta. Bimo. Bul.* 233 (1945), pp. 49-61).—Among the newer fungicides, certain derivatives of dithiocarbamic acid (e. g., Fermate, Dithane, and Methasan) have been more widely tested on vegetables in Ohio than have the chloro quinones or quaternary ammonium compounds. Fermate resulted in good control of ginseng blight, but was somewhat injurious to cucumbers; it gave only average control of carrot leaf spots, with some tendency to injury. Results on potatoes have varied somewhat, but its failure to control leafhoppers makes its general use questionable. It is on celery and tomatoes that Fermate offers the most promise. It has given good control of celery blight, both with and without sulfur, and yields from Fermate-treated plots have been excellent. It is especially effective in controlling the anthracnose fruit rot of tomato, with an average reduction in incidence of 75-80 percent. Its control of the foliage diseases of tomato is not equal to that by the fixed coppers. Fermate has caused only very minor injury in any instance when used at 2 lb. in 100 gal. of water. In a series of comparative trials (1944), zinc dimethyl dithiocarbamate in most cases gave even better results than Fermate on vegetables; it was also equally good against early blight of celery and tomato and anthracnose. It gave better control of early blight of potato and tomato than Fermate and was also more effective against potato leafhoppers. The copper and nickel salts of dithiocarbamic acid were not equal to those of Fe and Zn in controlling tomato anthracnose. Dithane gave fair control of early blight on potato and tomato but was not very effective against tomato anthracnose or the leaf blights of celery and carrot. Puratized N5-D gave only mediocre results as a potato spray, largely because of its failure to control insects, but it proved one of the best materials yet tested against anthracnose fruit rot of tomato and was moderately effective against early blight. Its general adoption as a spray on edible plant parts is, however, still to be decided because of possible hazards to health. Wettable Spergon failed in one test to give satisfactory control of tomato foliage diseases; a related material (code number "604") gave good control of both early blight and anthracnose though causing a superficial spotting of the fruits in two tests. In the one test tried, Ceresan as a spray for mature tomatoes gave good control of early blight but did poorly against anthracnose. The results on vegetables thus far obtained in Ohio serve to confirm the statement that the organic fungicides as a group have a much higher degree of specificity than those containing Cu. Judging from

data obtained during only 1 yr., zinc dimethyl dithiocarbamate appears to be the most generally effective of the compounds so far tested, closely followed by Fermate.

**Production in California of snap-bean seed free from blight and anthracnose,** W. W. MACKIE, W. C. SNYDER, and F. L. SMITH (*California Sta. Bul.* 689 (1945), pp. 23, illus. 1).—There is evidence that anthracnose and bacterial blights are the most important diseases of beans in the United States from the standpoint of losses; both are seed-borne. Even where very small amounts of either of these diseases are present, a disastrous loss may result when the seed from an infected field is planted under certain climatic conditions. Attempts have been made at control by various seed treatments, by application of sprays and dusts in the field, and by the development of resistant varieties; none of these methods has yet controlled the diseases in humid regions. Apparently the most promising and practical method is to prevent them through use of disease-free seed coupled with crop rotation. Since these diseases are wet-weather troubles, seed grown in the West is more likely to be free of infection than that from the East or Midwest. In certain Western States summer rains are sufficient, however, to permit development and spread of blight in some seasons, although most western seed may be free of anthracnose. These diseases do not occur in bean-seed crops grown in California during the dry, almost rain-free summers. Weather records show that during the bean-growing season California has far less rainfall than any of the other bean-growing States, and that the lack of summer rainfall in this State is consistent from season to season. The locations and limits of the disease-free areas in California suited to snap bean-seed production is shown in a map; these areas appear adequate to meet all demands in this country. Other advantages from California-grown seed are the low incidence of seed-borne mosaic and of field hybridization. Records of the success of California-grown field and snap bean seed in eliminating losses in Eastern and Southern States from anthracnose and blight are cited for New York, Michigan, and Louisiana. Because of low yields and high production costs, snap bean seed grown in California must sell at a higher price than seed from certain other States, but this represents exceedingly cheap insurance against disastrous losses from anthracnose and blight.

**Protecting cabbage plant beds from downy mildew with Spergon,** A. H. EDDINS. (*Fla. Expt. Sta.*). (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 195-199).—The damage caused by downy mildew in Florida seedbeds of cabbage is said to have made it impossible to grow sufficient plants to set the acreage. The best control in the tests reported was obtained when the Spergon treatments were started 7-10 days after planting the seed or before the disease appeared in the plant beds, and continuing three times a week except during cold weather when two treatments were sufficient. Poor control is likely to result if small hand-operated sprayers or dusters are used. Even when mildew is mildly severe, it is possible to grow 75,000 more plants per acre in the Spergon-treated than in the nontreated plant beds; furthermore, the treated plants are almost entirely free of mildew and make rapid growth after setting in the field.

**Phomopsis or "tip-over" of eggplant,** P. DECKER. (*Fla. Expt. Sta.*). (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 207-208).—A note on blight due to *Phomopsis vexans*, said to be the most important single disease of eggplant in Florida.

**Studies on the Fusarium of muskmelon wilt—I, Pathogenic and cultural studies with particular reference to the cause and nature of variation in the causal organism,** J. J. MILLER (*Canad. Jour. Res.*, 23 (1945), No. 1, Sect. C, pp. 16-43, illus. 14).—During the past 10 yr. a serious muskmelon disease has appeared in Ontario from which a *Fusarium* highly pathogenic in infection tests was isolated.

Results indicated that the wilt organism occurs in nature as a form (or forms) which—when cultivated on artificial media—produces abundant mycelium; this has been termed the "wild type." Mutations toward loss of aerial mycelium and darkening of the submerged mycelium were frequently observed in culture and, since many of the mutants were more aggressive than the parent, they tended to displace it. Evidence is presented that the wild type is genetically very stable in its natural environment. Since moreover, certain of the commoner mutants have caused less disease incidence in the field than the wild type, it is considered that variation of the sort found in culture—if it does occur in the field—is unlikely to become important in the field pathology of the disease. The stability of the wild type in sterilized soil and soil agar suggested that these substrates may prove of value for maintaining Fusaria in the pure state. Mutations were obtained by irradiating spores with ultraviolet light; in general, these resembled those appearing spontaneously, and both groups were less pathogenic than the wild type. A phenomenon termed "cultural interaction" was observed between certain of the mutant cultures and the wild type; since this appeared to be specific, it may prove of some taxonomic value in diagnosing *Fusarium* spp. It is suggested that the concept of wild type may be of general application throughout the genus.

**On pod spots in peppers,** H. BREMER (*Phytopathology*, 35 (1945), No. 5, pp. 283-287, illus. 2).—Decayed spots on pepper pods in Turkey, at first attributed to *Alternaria longipes*, were later reported to result from unfavorable physiological conditions. The fungus proved to be a secondary invader attacking the wounded pod. Symptoms of pod spot somewhat resemble those of blossom-end rot in tomatoes. It was not found possible to determine by the external appearance of the affected pods whether sunscald (heat damage) or blossom-end rot (result of disturbed water-balance) was responsible, and the data from several experiments led to the conclusion that the two are identical in the pod spotting of peppers. The damage occurs during strong solar radiation—but only in plants that are or have been subject to wide fluctuations in water supply. For practical control, the only measure possible would appear to be the avoidance of fluctuations in water supply through provision of moderate but frequent irrigations.

**Physiologic specialization in the tomato wilt fungus *Fusarium oxysporum* f. *lycopersici*,** L. J. ALEXANDER and C. M. TUCKER. (Ohio and Mo. Expt. Stas.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 9, pp. 303-313, illus. 1).—A race of *F. oxysporum* f. *lycopersici* isolated in Ohio appears to have a distinctive type of pathogenicity; comparison of isolates from various sources revealed that tomato lines resistant to isolates of types previously studied may be completely susceptible to the one from Ohio. Inheritance of resistance to the Ohio race apparently involves the gene for resistance to the Missouri race and an undetermined number of complementary genes. *Lycopersicon pinnatifidifolium* (accession 160) appears to be segregating for resistance and susceptibility to the Ohio race, possibly due to heterozygosity for the complementary resistance factor or factors. All commercial varieties of tomato tested were susceptible to the Ohio isolate, which is shown to be a new race of the tomato wilt *Fusarium*.

**Causes of premature defoliation of the sour cherry,** E. J. RASMUSSEN. (Mich. State Col.). (*Amer. Fruit Grower*, 65 (1945), No. 4, pp. 8-9, 22, 32, illus. 7).—The more common causes of premature defoliation of the sour cherry are said to be drought, fertilizer treatment, disease injuries by leaf spots and cherry yellows, insect injury, and spray treatments. These causes are discussed and illustrated and remedial measures suggested.

**Peach cankers and their control,** E. M. HILDEBRAND (*N. Y. State Col. Agr., Cornell Ext. Bul.* 657 (1944), pp. 24, about 18 illus.).—Information is presented on how to recognize the perennial (*Valsa*) and annual (*Monilinia* and *Fusicoccum*)

cankers of peach, the fungi concerned, control measures, and after-treatment of wounds.

**Yellows, a non-infectious disease of the Progressive everbearing strawberry in Montana,** H. E. MORRIS and M. M. AFANASIEV (*Montana Sta. Bul.* 424 (1944), pp. 11).—This disease became a limiting factor to commercial production in the Bitterroot Valley about 1925. It causes the plants to become yellow, dwarfed, decreased in productivity, and short-lived, and eventually to die. Yellows is systemic in nature and transmitted through the seed. Grafting of runners from diseased and healthy plants gave negative results. Aphids fed on diseased and transferred to healthy plants failed to transmit the disease under the experimental conditions. Various soil amendments had no effect on yellows-diseased plants. The findings suggest that the disease is genetic in character. Use of "Montana Progressive" strawberry—produced by the station—is the only known method of avoiding losses from yellows in the Progressive type of strawberry.

**Origen de las ilustraciones de la antracnosis de la vid publicadas por Lefevre** [Origin of the illustrations of grape anthracnose published by R. F. Lefevre], A. E. JENKINS and A. A. BITANCOURT (*Bol. Sanid. Veg. [Chile]*, 3 (1943), No. 2, pp. 172-175, illus. 1).

**Mottle-leaf control:** Methods of applying zinc spray to correct deficiency in citrus, E. R. PARKER, C. O. PERSING, and E. C. MOORE. (*Calif. Citrus Expt. Sta.*) (*Citrus Leaves*, 25 (1945), No. 4, pp. 6-7, 30, illus. 4).—Experimental results and the experience of growers over several years have shown that mottle-leaf (Zn deficiency) is most effectively controlled and efficiently accomplished by applying sprays containing suitable Zn compounds. Dusts have proved less effective, and soil applications are uneconomical, uncertain in result, and may kill or cause permanent injury to the trees. Recommended methods of applying Zn sprays which have proved effective are here described.

**How to apply zinc spray for mottle-leaf control,** E. R. PARKER, C. O. PERSING, and E. C. MOORE. (*Calif. Citrus Expt. Sta.*) (*Calif. Citrog.*, 30 (1945), No. 7, pp. 200-201, illus. 4).—Methods of applying Zn spray are discussed, with special reference to use of the spray duster.

**Pulling versus clipping of oranges in respect of loss from stem-end rot and blue mold,** E. F. HOPKINS and K. W. LOUCKS. (*Fla. Expt. Sta.*) (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 80-86, illus. 5).—Three orange varieties were used in this study (1943-44), samples being taken at various times during the season in such a way that the reliability of the data could be determined. Careful statistical analysis of the results indicated that there was no significant difference in stem-end rot, blue mold, and total loss after 3 weeks' storage; after 5 weeks there was significantly less stem-end rot in the pulled fruit but more blue mold. Additional data on four varieties—including Valencias—rendered it apparent that pulling of the fruit was more effective among the last than among the other varieties. This is believed due to the fact that a higher ratio of the calyxes was removed than was the case with the Hamlin, Pineapple, or Parson Brown varieties.

**A study of certain methods for the control of stem-end rot and blue mold in oranges,** E. F. HOPKINS, K. W. LOUCKS, and C. R. STEARNS, JR. (*Fla. Expt. Sta.*) (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 87-98, illus. 2).—On the basis of a large number of coordinated experiments in which certain well-known treatments were tried in various combinations, the authors point out several apparently practical procedures which resulted in a high degree of control of these troubles. Stem-end rot was best controlled by (1) gassing with ethylene-debuttoning-borax mixture treatment, averaging 91 percent control—this method can also be used to color the fruit; (2) partial debuttoning on pulling, including removal of the calyx and averaging 88 percent control; (3) partial debuttoning mechanically, averaging 86.4 percent control; and (4) partial debuttoning mechanically followed

by borax treatment, averaging practically 100 percent control. Blue mold, including loss from other mold fungi, was decreased by some of the above methods and was not increased by the others. The total loss of fruit from all causes was thus very low for the partial debudding plus borax. Though there still remain some problems as to practical applications, the large number of oranges used and the way in which the experiments were arranged are thought to give a very high degree of certainty that these procedures will prove effective in commercial control of stem-end rot and blue mold.

**Studies on the use of formaldehyde and sodium ortho-phenyl-phenate in the control of decay in citrus fruits,** E. V. MILLER, J. R. WINSTON, and G. A. MECKSTROTH (U. S. D. A.). (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 144-148).—Sodium ortho-phenyl-phenate (Dowicide A) was found to be one of the most promising new compounds tried for controlling decay in citrus fruits, but it injured the rinds. This difficulty was practically overcome by adding 1 part by weight of commercial formaldehyde (35 percent strength) to 4.5 parts of Dowicide A in aqueous solution; the mixture can be prepared as much as 1 mo. in advance of use. This mixture was used in both aqueous solutions and wax emulsions, adding the mixture to the water used for diluting the wax rather than to the wax itself. The mixture did not break the emulsions of the 5 or 6 waxes tried. Under commercial conditions Dowicide A was effective in controlling decay only when applied as a warm flood spray; the concentrations recommended are 1.25-2 percent, depending on the method of application. Applying the mixture as a mist was not effective even when the concentration of Dowicide A was as high as 3 percent.

**Protecting papaya plants from nematodes by the planting of Crotalaria spec-tabilis,** G. BATES and D. FAIRCHILD (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 181-182).—A note on observations by the first author.

**Some etiological aspects of mealybug wilt,** W. CARTER. (Pineapple Res. Inst. Hawaii). (*Phytopathology*, 35 (1945), No. 5, pp. 305-315, illus. 5).—Symptom expression was found to be conveniently designated in four progressive stages and one recovery stage. Limited expression may occur and 1 or 2 leaves only be affected if the period for development of symptoms is prolonged; this period—ranging from 43 to 295 days—is affected by the age of the plant at time of infestation. Recovery from advanced stages of wilt occurs, but that from the first stage can occur with complete loss of symptoms. Recovery may also be affected by N fertilization, but the age of the plant at time of infestation is a factor. Frequent mealybug infestation adversely affects recovery. There is additional evidence that mass action is a factor and that subwilting mealybug colonies—when joined—will cause wilt. Recovered pineapple plants are susceptible to later infestation and will wilt a second time, with typical symptoms. Reduced wilt incidence in greenhouses and on the north side of two-row beds suggests that light exposure is a factor in susceptibility. Wilt in field plots is localized, and diagrams showing the pattern of wilt incidence are presented. When infested planting material was planted and the mealybugs were removed, no effect of these colonies on susceptibility to later infestation was demonstrable.

**The influence of plant nutrition on susceptibility of pineapple plants to mealybug wilt,** W. CARTER. (Pineapple Res. Inst. Hawaii). (*Phytopathology*, 35 (1945), No. 5, pp. 316-323).—Pineapple plants grown at various levels of N, P, K, Ca, and Fe developed with extreme variation in growth status, which was accentuated by partial soil sterilization with chloropicrin. The plants were then infested with mealybugs and the resulting mealybug wilt recorded; the differences in fertilizer application failed, however, to affect the susceptibility to wilt. High N application appeared to reduce susceptibility, though in one test only. The most significant result was in the reinfestation of plants that were recovering from severe wilt, adverse growth conditions increasing their susceptibility to a second wilting.

**Informe fitopatológico sobre la plantación de cinchona en Punizas [Phytopathological information on the growing of cinchona in Punizas], R. C. LORENZ ([Peru] Min. Agr., Colon. y Foresta, 1 [1944], No. 2-3, pp. 5-12, illus. 7).—A general discussion—including experimental data—of diseases of the roots, shoots, and leaves and their control.**

**Prevention of scale rot in the propagation of Easter lilies, W. D. McCLELLAN and N. W. STUART. (U. S. D. A.). (*Florists Exch. and Hort. Trade World*, 104 (1945), No. 16, pp. 12, 45, illus. 3).—In answer to numerous inquiries from growers following publication of a technical paper previously noted (E. S. R., 92, p. 383), the authors here summarize—with some additional information—the methods used and the results obtained.**

**Control of the gall disease of Gypsophila caused by *Phytomonas gypsophilae* (Brown) Magrou, P. P. PIRONE. (N. J. Expt. Stas.). (*Phytopathology*, 35 (1945), No. 5, pp. 368-369).—Dipping newly grafted gypsophila plants for 2-3 min. in calcium hypochlorite solution gave excellent control of this disease. The solution is prepared by mixing from 2 to 6 oz. of ordinary chloride of lime in a gallon of water and passing through filter paper the day before use.**

**A cercospora leafspot of cultivated Physostegia, W. A. JENKINS. (Va. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 5, pp. 324-331, illus. 2).—The symptomatology and etiology of a destructive leaf spot of cultivated *P. virginiana* were studied over a full season. Symptoms first appeared during June-July on the lowermost leaves, but the disease did not become epidemic until August. The lesions appeared pale yellow at first with dark centers, but developed through shades of brick-red to a final pale to dark brown and then enlarged until often most of the leaf surface was involved. The fungus, heretofore undescribed, produced a hyphomycetous conidial stage characteristic of the form genus *Cercospora*, as well as spermatogonia and perithecia. The perfect stage is described as *Mycosphaerella physostegiae* n. sp. A single season's observations indicate that this leaf spot may be controlled by removing and burning the cast leaves at any time between leaf fall and mid-April of the following season.**

**Lime and fertilizers in relation to blackspot of roses, A. G. SMITH, JR. (*Virginia Sta. Bul.* 368 (1945), pp. 10).—The experiments described suggest that the amount of potash recommended by C. Mallerin in the formula 1.0 N-2.5 P<sub>2</sub>O<sub>5</sub>-3.5 K<sub>2</sub>O is excessive when applied annually to well-prepared mulched rose beds in Virginia. This difference might be due to original soil and other environmental variables in the localities concerned, but only further studies will allow definite conclusions to be reached. This study also supports the growing belief that, within reasonable limits, lime has no material effect on the growth of roses or on development of blackspot if the soil to which the lime is added is high in organic matter and in good mechanical condition. The results indicate that the degree of resistance to blackspot shown by a particular variety is more important in its control than the excessive use of potash as a fertilizer.**

**The effect of brief temperature treatments on germination of urediospores of *Phragmidium mucronatum* (Fr.) Schlecht, V. W. COCHRANE. (Cornell Univ.). (*Phytopathology*, 35 (1945), No. 5, pp. 361-366).—Urediospores of the rose rust fungus were germinated on the surface of 2 percent water agar; those germinating at 6°, 8°, or 9° C. were then held for 5- to 10-min. periods at 27° at different times during germination. This brief warming, when performed during the first 24 hr. after sowing of the spores, caused large increases in germination; warming after 24 hr. of incubation had no effect. Germination at temperatures higher (24°, 27°) or lower (3°, 6°, 9°) than the optimum (18°) was significantly increased by preliminary 1-hr. incubation at 18°. The bearing of these results on methods of spore germination is discussed.**

Influence of temperature on the Dutch elm disease in potted American elm, L. J. TYLER. (Cornell Univ.). (*Phytopathology*, 35 (1945), No. 5, pp. 302-304).

—Potted American elms 3-4 yr. old and grown from cuttings were inoculated, while growing, with *Ceratostomella ulmi*. These trees were exposed in controlled temperature chambers usually for 1 week to a month, some being constantly exposed at a given temperature and others alternated between two temperature levels; outdoor conditions also were utilized. The temperature series ranged from about 10° to about 35° C., approximately 15°-29° favoring disease development, with the optimum at about 26°-29°. The temperature extremes definitely retarded and sometimes completely stopped disease development. Transfer of trees held for short periods at temperatures favorable to disease development to those unfavorable to it retarded the appearance of symptoms; the reverse treatment permitted normal but delayed symptom development.

Tip blight of species of *Abies* caused by a new species of *Rehmielopsis*, A. M. WATERMAN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 10, pp. 315-337, illus. 4).—A tip blight of native *A. balsamea* in northern New England, of the ornamental *A. cephalonica* in southern New England, and of *A. concolor* in New England and New York was found due to *R. balsameae* n. sp. The disease somewhat resembles that caused by *R. abietis* on *Abies* spp. in Europe and on *A. lasiocarpa* in British Columbia. The current season's needles are attacked, and a dieback of terminal or lateral shoots may result. Cankers are sometimes formed on twigs of *A. concolor* at the base of infected needles. Infection occurs in early spring just as the new growth is developing. The fruiting bodies begin to form soon after infection; the spores mature the following spring. No imperfect stage has been observed. Inoculations proved the pathogenicity of *R. balsameae* on *A. concolor* and also showed that *A. fraseri* is susceptible. Small nursery trees of *A. fraseri*, *A. nobilis*, and *A. holophylla*, planted in an area of infected trees of *A. concolor*, proved susceptible to spontaneous infection. Cross infection from *A. balsamea* to *A. concolor* was obtained by planting a young tree of the latter under a heavily infected native balsam fir. The importance of tip blight as a forest tree disease is not yet definitely known, but because of its wide distribution on native balsam firs control measures would not be feasible in the forest. On ornamental white firs satisfactory control was obtained by three sprayings at 12-day intervals of a 4-4-50 bordeaux plus casein. The first application should be made as soon as the new growth begins to emerge.

Little leaf disease of pine, G. H. HEPTING, T. S. BUCHANAN, and L. W. R. JACKSON. (Coop. Univ. Ga., Ala. Polytech. Inst., and U. S. D. A.). (*U. S. Dept. Agr. Cir.* 716 (1945), pp. 15, illus. 5).—This disease of *Pinus echinata* and to a lesser extent of *P. taeda* was found to occur over wide areas in the southeastern United States, with occasional evidence of infection in some other southern pines. It is characterized by marked reduction in growth of shoots and wood, short and yellowish foliage, and premature death, usually at 20-50 yr. Two fungi common on pine roots have been shown capable of killing 2-year-old shortleaf pines and may be implicated in the little leaf disease. Some recovery in the field has been induced by adding N, P, K, and borax to the soil, but trials with many other soil amendments failed. Symptoms similar to little leaf have been induced by trenching around normal trees or otherwise severing a large proportion of the roots. The reserve food content of the roots of diseased trees is far below normal. Tests of the virus hypothesis by bark-patch grafts from diseased to healthy trees have thus far failed to give any clear indication of transmission. From present indications little leaf appears not to be caused by weather, or by lack of P or K, or soil moisture. Experiments indicate that among the possible causes the following remain prominent: Lack of some element, as N or B;

improper physical condition of the upper soil layers; two root fungi; and perhaps a virus. Other possibilities still remain, but further conclusions must await the results of comprehensive experiments now under way. Cutting practices for little leaf stands should involve removing all diseased trees every 7 yr., or preferably at shorter intervals, since the average time from early symptoms to death is 7 yr. Little leaf trees make an important source for pulpwood, fuelwood, cross ties, poles, and small sawlogs.

**Annual report of white pine blister rust control—Michigan—1944,** J. K. KROEBER. (Coop. U. S. D. A.). ([Lansing]: Mich. Dept. Agr., 1944, pp. 36+, illus. 3).—See also previous reports (E. S. R., 91, p. 47).

**Spread of white pine blister rust during 1944,** J. F. MARTIN. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 4, pp. 287-288).—This disease has been reported from 28 States; the chief points of interest in connection with its spread in 1944 were the finding of infected white pines in 5 new counties of northwestern Iowa, a 65-mile southward extension of the rust on *Ribes* in California, the discovery of infection on *Ribes* in Yellowstone National Park, and the finding of the disease on *Pinus flexilis* within its natural range. These reports are briefly discussed.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**The influence of types of soil upon the local distribution of some mammals in southwestern Utah,** R. HARDY (*Ecol. Monog.*, 15 (1945), No. 1, pp. 71-108, illus. 19).—The texture of the soils in this area was found to influence the distribution of small mammals, both directly by type of shelter offered and indirectly through its effects on soil chemicals and moisture and on vegetation type. Of the 18 races of rodents studied most intensively, 9 commonly inhabit rocky situations; 3 of these and 7 others live in gravelly soils, and 2 rock-living rodents, 5 inhabitants of gravelly soils, and 2 others live on fine-textured sands and loams. These 18 races seem therefore to have varying degrees of dependence on soil texture. The principal influence of the concentration of soil chemicals on the mammals seemed to be through their effects on the plants. Carbonates which form a hardpan or "caliche" and sulfates which form a cementlike crust on the surface, however, may interfere with digging by animals and probably directly influence the distribution of such rodents as kangaroo rats and pocket mice. Soil moisture affects the mammalian distribution principally through its effect on the density of the vegetation of this desert region. Nowhere in the area studied was there enough water in the ground to prevent directly the presence of any of the upland-dwelling rodents. Extremely shallow soils were not used as home sites by burrowing rodents such as *Dipodomys microps*, though these areas may be occupied either by burrowing *D. merriami* or by rock-dwelling species such as *Peromyscus crinitus* or *Perognathus formosus*. The deeper soils affect the mammals indirectly by supporting heavy plant growth and directly by offering room for burrowing. The degree of slope or gradient affects the soil chemicals and texture, both of which influence mammalian distribution. Some species such as *P. longimembris virginis* and *D. microps* were not taken on steep slopes, whereas *P. formosus* and *Peromyscus crinitus* were most abundant in such situations. Dark-colored soils were most often the home sites of dark-colored races of rodents, while light-colored soils most often offered home sites to the light-colored races. Four species of reptiles and three of sand-dwelling mammals that live on the light-colored soils west of the rocky Beaverdam Mountains do not enter the Saint George Basin; these mountains also form a barrier at least partially isolating five races of dark-colored mammals on the east from their light-colored relatives on the west. Races dwelling in lava rocks east of the Beaverdam Mountains are usually darker than either the individuals inhabiting the red and brown sands of the Saint George

Basin or their near relatives dwelling in light-colored rocks west of these mountains. This correlation between pelage color and soil color could result from selection accompanied by isolation caused by the Beaverdam Mountains. Color differentiation of these small rodents depends on both the texture and the color of the soils. Over two pages of references are given.

The recent status of Nova Scotia fur bearers, A. L. RAND (*Canad. Field Nat.*, 58 (1944), No. 3, pp. 85-96).—Data are presented on black bear, American beaver, raccoon, American marten, mink, short-tailed weasel, otter, skunk, red fox, Canada lynx, wild cat, muskrat, and squirrel.

The status of the fisher (*Martes pennanti (Erxleben)*) in Canada, A. L. RAND (*Canad. Field Nat.*, 58 (1944), No. 3, pp. 77-81).—The fisher is said to be one of the rarest and most valuable wild-caught fur animals. It was never common and is slowly decreasing in numbers; even now, however, a sizeable stock of animals exists in the wild, a stock deserving close attention. The cyclic nature of its fluctuation in numbers suggests one type of management to enable it to recover more quickly from periods of scarcity and to provide a larger harvest over more years in periods of abundance. Fur farms are raising fisher and successfully breeding them, but the yield from this source is thus far of little importance.

Bird-censusing and its values, G. O. HENDRICKSON. (Iowa State Col.). (*Iowa Bird Life*, 15 (1945), No. 1, pp. 2-5, illus. 2).

The 1944 Christmas bird census in Iowa, F. J. PIERCE (*Iowa Bird Life*, 15 (1945), No. 1, pp. 6-9).

Some contributions of a fifteen-year local study of the northern bobwhite to a knowledge of population phenomena, P. L. ERRINGTON. (Iowa Expt. Sta. et al.). (*Ecol. Monog.*, 15 (1945), No. 1, pp. 1-34, illus. 23).—In this study of a 4,500-acre area near Prairie du Sac, Wis.—centered on the bobwhite quail but also dealing with a number of associated species, especially other wild Galliformes, predators, and "buffers"—it was found that year-to-year differences in many of the conventionally regarded "limiting factors" had no perceptible influence on basic population trends. Although severe mortality resulted from starvation, weather, and predation, the outstanding factor in the population mechanics of bobwhites in the North Central States was seen to be their own density relations as modified by what may be termed depression phases. The data available showed a very strong tendency for population gains in a specific locality, spring to fall, to be in inverse ratio to spring densities. These rates of gain plotted against densities tended to define reverse sigmoid curves, seemingly irrespective of most variations in temperature, rainfall, farming practices, and kinds and numbers of associated wild species, including predators. Rates of summer gain in relation to density were subject to depression through the presence of introduced wild Galliformes, but the most pronounced depressions of summer gains occurred through the evident operation of the phases. There was also a strong tendency for rates of nonemergency winter loss to follow mathematical patterns determined by density and phase effects. Wintering populations experienced low rates of nonemergency loss and little if any acceleration of loss rates with rising densities as long as the populations remained below thresholds of security, but such loss rates for populations in excess of secure levels tended to define characteristic sigmoid curves. Inverse ratios in summer gains and operational levels of winter thresholds showed what looked like phase linkages.

Except for the summer of 1936 and the winter of 1936-37, bobwhite populations in this area were responsive to two recognized phases—one of "normal" and the other of depressed rates of summer gain and correspondingly increased rates of nonemergency winter loss. Within the time span of influence imposed by each

phase, the above rates of gain or loss conformed to mathematical formulas with high predictability, but the time of changing of one phase to the other was not predictable according to any known criteria. A third extreme phase appeared to be linked with extreme depressions (1936-37) of nearly all of the region's mammals and birds about which information was available. In the classically cyclic ruffed grouse, the lesser phase changes seemed to follow a more predictable course, one of progressive sequences as the low of the cycle was approached or passed. Despite an apparent lack of synchrony and periodicity in the two main phases of the bobwhites and what appeared to be similar phases of this and other species elsewhere, it is suggested that depressed rates of summer gain and increased rates of winter loss in relation to density—if not clearly due to emergencies—may be more reliable indications of cyclic behavior than the often overstressed gross fluctuations in numbers of animals. This applies particularly to species that are highly susceptible to confusing emergency losses—as the bobwhite wintering in the northern parts of its range. Of the properties exhibited by the bobwhite and at least some other higher vertebrates during cyclic depressions, one may be judged significant, viz., a tendency to suffer nonemergency losses more nearly in straight proportion to numbers than at other times. No satisfactory explanation for phase phenomena—periodic or otherwise—seems to be yet in sight. Current preference is expressed for some sort of cosmic influence possibly modifying the psychology (notably as concerns limits of intraspecific toleration) of the species affected. There are 70 references.

The family Anatidae, J. DELACOUR and E. MAYR (*Wilson Bul.*, 57 (1945), No. 1, pp. 3-55, illus. 25).—The new classification of the duck family proposed attempts "to arrange the species in related groups and in a natural sequence, and to adjust the nomenclature of species and genera to progressive concepts of these categories." There are 20 references.

Grosbeak damage to Scotch pine, D. B. COOK and E. W. LITTLEFIELD (*Jour. Forestry*, 43 (1945), No. 4, pp. 269-272, illus. 1).—The authors add the pine grosbeak to the already long list of enemies of Scotch pine. The injury caused is described, with the suggestion that it may prove sufficiently serious to deserve consideration in deciding on the advisability of planting this species in the Adirondacks.

Ring-billed gulls (*Larus delawarensis*) fly-catching, M. B. and M. A. TRAUTMAN. (Ohio State Univ.). (*Wilson Bul.*, 57 (1945), No. 1, p. 77).

Some factors affecting ring-necked pheasant population density, A. S. EINARSEN. (Oreg. Expt. Sta. et al.). (*Murrelet*, 26 (1945), No. 1, pp. 3-9).—Inventories indicate that even when ring-necked populations reach 900 to each 100 acres the loss of adults is very limited. Field records showed that annual winter losses were light and that bird and mammal predation averaged less than 9 percent of the total ring-necked population. No disease was found, and fertility during the last nesting season was 92.5 percent on the 394-acre island tract under study in Washington State. It thus appeared that the decrease found had resulted from losses of eggs or chicks. Molestation of hens by cocks was common, and abandonment of nests increased with the population. Wet weather at hatching time may also have been an adverse factor. The high population level attained on this island in only 6 yr.—where only man and his activities were controlled—indicates that the effects of man on wildlife throughout the nation may hitherto not have been properly evaluated. It is also apparent that natural reproduction is far more effective than year-to-year attempts at artificial restoration; the latter has its greatest value in providing nuclear stock on barren habitat range. North and South Dakota and eastern Oregon are other sections where large increases have resulted primarily from natural reproduction.

**Ecology and management of the redhead (*Nyroca americana*) in Iowa.** J. B. Low. (Iowa Expt. Sta. et al.). (*Ecol. Monog.*, 15 (1945), No. 1, pp. 35-69, illus. 21).—Northbound redheads reached the area under study (Clay and Palo Alto Counties, 1938-41) about March 20; peaks of spring migration were noted March 21-25 and April 11-18, the latter representing the main flight. The yearly 3,000-4,000 migrants preferred the open water of lakes for resting at night, and bays of the lakes and large vegetated marshes were frequented in the daytime. The sex ratio was 1.42 ♂♂ to 1 ♀ among 3,400 individuals. Toward the latter part of April the mated ducks left the deeper water areas to seek nesting places in the vegetation of shallow marshes and sloughs. Although 28 other species of marsh-nesting birds were observed in the marshes, there appeared to be little conflict between them and the redheads. The numbers of early nesting redheads as well as of migrants were retarded by abnormally low temperatures during April and May 1940—nesting extending 28 days longer than in the two preceding seasons; the late renesting attempts—after previous nests had been deserted because of declines in water level—accounted for the extended 1940 nesting season. During May 8-24 the nesting season was at its height. A total of 160 nests were under observation—42 in 1938, 53 in 1939, and 65 in 1940. The average density was calculated to be 1 nest to 10.6 acres, though a high density of 1 nest to 2 acres was found on each of several small ponds. Of the 160 nests, 90 terminated successfully, 48 were deserted, and—of 22 destroyed nests—12 were flooded, 4 destroyed by mink, 2 by crows, and 4 by unknown causes. Recession of water levels caused desertion of 16 nests; a comparatively stable water level was correlated with a high percentage of nest success. The apparent intolerance of the ♀♀ to laying eggs in their nests by other ducks resulted in the desertion of 16 nests. The amount of promiscuous nesting was inversely proportional to the nesting success and directly so to the fluctuation of water levels. An average of 9.75 eggs was recorded for 115 complete clutches.

No definite rhythms of incubation were carried out by the ♀; an average of 17.6 hr. a day was spent on the nest by one closely observed ♀ during the 24-day incubation period. Hatching started June 1 and the last nest hatched August 12. A total of 45.1 percent of the eggs produced young. The most extensive nesting cover plant species were lake sedge, narrow-leaved cattail, hardstem bulrush, and awned sedge. The depth of water in which these plants were located and proper interspersion and density of nesting cover proved more important criteria in the choice of nesting sites than any preference shown for particular cover plant species. Nesting densities for the important cover plants were one nest for 3 acres of slender bulrush, 6 acres of hardstem bulrush, 11 acres of whitetop, 13 acres of sedge, or 16 acres of narrow-leaved cattail. Nests were built in marshes an average of 72 yd. from the outer edge of the marsh vegetation, and 85 percent of them were located within 50 yd. of open water. The nearest open water for 64 percent of the nests was around muskrat lodges. Nesting densities reached a maximum where not less than 10 percent or more than 25 percent of the habitat was open water. Nests were constructed over water averaging 11 in. in depth. The hardstem bulrush-river bulrush-burreed community was found most important as juvenile rearing cover. Brood counts indicated that the greatest duckling mortality occurred during the first week of life. Evidence was observed of juvenile mortality from mink and snapping turtle predation, lead poisoning, exposure to weather, congenital disabilities, and trampling by the ♀♀ of other young. The flight of the juveniles preceded the fall migration of northern redheads by nearly a month. An average of 6.3 juveniles of each brood survived, representing a 70-percent survival of the hatched young. Leeches parasitized 80 percent of the young, but were not found to cause death.

Redheads comprised about 5 percent of the 1939 birds bagged by hunters. Food plants essential to redheads were abundant in all marshes and in most of the lakes of the area. An adequate controlled water level is considered the most important factor for insuring production and utilization of cover and food plants by redheads. There are 31 references.

**Age groups and longevity in the American robin.** D. S. FARNER (*Wilson Bul.*, 57 (1945), No. 1, pp. 56-74).—The author presents data from 855 robins (*Turdus migratorius migratorius*) banded as young and subsequently recovered and studied from the standpoints of age groups, longevity, and life expectancy. There are 42 references.

**Control of injurious birds.** F. M. BAUMGARTNER (*Oklahoma Sta. Mimeog. Cir.* 132 (1945), pp. 8+).—An informative circular discussing certain species (hawks, owls, crows, starlings, blackbirds, and English sparrows) which are sometimes injurious and suggesting methods of preventing damage.

**Cytophaga columbaris (Davis) in pure culture: A myxobacterium pathogenic to fish.** L. GARNJOBST (*Jour. Bact.*, 49 (1945), No. 2, pp. 113-128, illus. 5).—*Bacillus columbaris* Davis, a dermal parasite of fresh-water fishes, was isolated and grown on peptone media and in hydrolyzed casein added to a mineral base. Its morphology, aflagellar type of creeping motility, and absence of microcysts in the life cycle led the author to place it in the order Myxobacterales, family Cytophagaceae; reasons for placing the organism in the genus *Cytophaga* are presented. It was found to differ from other members of the genus in not attacking cellulose to any extent, in its parasitic nature, and in other minor respects.

**Professional training in entomology.** M. A. STEWART. (Univ. Calif.). (*Pan-Pacific Ent.*, 21 (1945), No. 1, pp. 1-10).—An address.

**Insect photography with limited equipment.** E. T. JONES and P. A. PIPER. (U. S. D. A.). (*Kans. Acad. Sci. Trans.*, 47 (1944), No. 2, pp. 275-282, illus. 14).—Special laboratory equipment is expensive and now generally unobtainable. The authors show how—by utilizing a camera with a long bellows extension and such lenses as are generally available around an entomological laboratory—equipment equal in efficiency to the best can be made up at inconsequential cost.

**Montana insect pests, 1943 and 1944: Thirtieth report of the State entomologist.** H. B. MILLS, J. A. CALLENBACH, and J. F. REINHARDT (*Montana Sta. Bul.* 425 (1945), pp. 30, illus. 6).—This report (E. S. R., 88, p. 655) considers the major insect control problems in the State, including the grasshopper program (coop. U. S. D. A.) and outlook for 1945, Mormon cricket control, and the wheat stem sawfly; and other important insect pests, including those attacking potato and wheat, and miscellaneous insect records and observations. The report of the State apiarist summarizes the work on American foulbrood, nosema disease, and the utilization of honey-producing resources.

**Modelo de jaula que permite la distribución de parásitos dentro de las pupas de sus huéspedes [Model of a cage which permits the distribution of parasites within the pupas of their hosts].** K. J. HAYWARD (*Rev. Indus. y Agr. Tucumán*, 34 (1944), No. 1-3, pp. 23-26, illus. 2).—The construction of this equipment is described and illustrated, and its employment with pupae of the fruitfly *Anastrepha fraterculus* Wied. is described.

**A catalogue of the parasites and predators of insect pests.—Section 1, Parasite host catalogue, III, V (Belleville, Ont.: Imp. Parasite Serv., 1944, sec. 1, pts. 3, pp. 149+; 5, pp. 130+).**—These two parts (E. S. R., 91, p. 176) comprise, respectively, the parasites of the Hemiptera and those of the Lepidoptera (A-Ch).

**I parassiti delle piante officinali: Repertorio dei parassiti vegetali ed animali che danneggiano le piante officinali, aromatiche e da profumo, spontanee e coltivate, e le droghe officinali immagazzinate [The parasites of officinal**

plants: A compendium of plant and animal parasites injurious to spontaneous and cultivated officinal, aromatic, and perfume plants and stored officinal drugs], A NANNIZZI (*Roma: Ist Poligrafico dello Stato, 1941, pp. 544+*)

New possibilities in agricultural and horticultural insecticides, R. L. MILLER (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 117-122).—Some of the new fungicides and insecticides and new methods for applying sprays are discussed

Quarterly bibliography on insecticide materials of vegetable origin, No. 28 (July to September 1944), R. M. JOHNSON (*Bul. Imp. Inst. [London]*, 42 (1944), No. 4, pp. 264-272).—A continuation of this bibliography (E. S. R., 92, p. 679).

Il piretro insetticida [Insecticidal pyrethrum], R. CIFERRI and F. GRILLI (*Genova (Genoa): Soc. Anonima Editrice D. Alighieri, 1941, pp. 75+, illus. 11*).—This volume, the introduction to which is by B. Longo, considers the sources and history of pyrethrum, its culture, production, and use with particular reference to Italy, the active principle and its physiological effect, the production of industrial derivatives, and the variability of the plants in relation to selection.

A test of some poisons and their carriers on two destructive cutworms, E. G. KELSHEIMER. (*Fla. Expt Sta.*). (*Fla. State Hort. Soc. Proc.*, 57 (1944), pp. 211-215).—In the tests reported against the black cutworm and the granulate cutworm, the fluorine compounds, sodium fluosilicate and the synthetic cryolite "Alorco" and the natural cryolite Kryocide—both of which are sodium fluoaluminates—were the quickest killers; rice bran was the best carrier used throughout the tests, with wheat bran next.

Influence of mercury on insect eggs.—Part 1, B. KRISHNAMURTI and M. APPANNA (*Cur. Sci. [India]*, 14 (1945), No. 1, pp. 7-10, illus. 2).—It is concluded from the evidence presented that metallic Hg acts adversely on eggs of stored grain insects, but larvae and adults develop normally; 0.03 and 0.05 gm. of Hg are the minimum lethal doses for 3,300 and 4,000 cc. of empty space, respectively; in a known empty enclosed space in which eggs and Hg are kept together, the eggs of *Coryza cephalonica* and *Bruchus chinensis* are killed after a 48-hr. exposure; the minimum lethal dose effective in a particular empty space may not be wholly effective on all the eggs contained in the same space filled with grain.

Methyl bromide fumigation, J. B. STEINWEDEN (*Calif. Dept. Agr. Bul.*, 34 (1945), No. 1, pp. 4-14, illus. 3).—This is a general discussion (43 references) of the development and application of methyl bromide in the alleviation of plant quarantines and in the commercial control of certain insect pests of grain, fruit, and nursery stock. It is used by the U. S. Department of Agriculture and by many States for fumigating nursery stock, fruits, vegetables, and containers moving under quarantine regulations. Commodities treated with this material and so certified are accepted by all States and by most counties in California. The Army and Navy have adapted its use for fumigating personal equipment and stored foods. As with all materials, methyl bromide has certain limitations, such as that its use must be confined to gastight enclosures, but its wide employment by government agencies, commercial concerns, and the armed services supports the claims for its efficiency.

DDT as a horticultural insecticide, A. A. GRANOFSKY. (*Minn. Expt. Sta.*). (*Minn. Hort.*, 73 (1945), No. 4, pp. 52-53, 55).—A brief account of experiments with DDT on garden crops, potato, and apple. Particular mention is made of its effectiveness against potato insects (Colorado potato beetle, flea beetles, leafhoppers), leafhoppers on carrots, cabbage insects, squash bugs, and cucumber beetles, and its value and limitations are discussed.

Preliminary report on the identification of 2,2 bis(p-chlorophenyl)-1,1,1 trichlorethane (DDT) in the excreta of poisoned rabbits, E. F. STOHLMAN (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 13, pp. 350-353, illus. 1).—The crystalline

form was isolated from the urine of rabbits after receiving DDT by mouth. Another fraction containing organic chlorine was found soluble in water made alkaline with sodium carbonate and was reextracted with ether after acidification; work on its isolation and purification is in progress. Crystals containing organic chlorine were obtained from the feces of rabbits fed DDT; these appeared to be unchanged and probably unabsorbed DDT.

**Trade marked insecticides containing DDT,** R. C. ROARK. (U. S. D. A.). (*Soap and Sanit. Chem.*, 21 (1945), No. 4, pp. 137, 155, 157).—Information is presented on the composition of trade-marked products containing DDT.

**Ortho-dichlorobenzene as an insecticide,** F. W. FLETCHER (*Pests*, 13 (1945), No. 3, pp. 15-28).—A review of the literature (170 references) revealed that *o*-dichlorobenzene is particularly useful for controlling powder-post beetles in seasoned wood and is efficacious for treating branches and trunks of trees infested with bark beetles. As a soil fumigant, it has been used successfully for controlling subterranean termites around basement walls. This compound has also shown considerable promise in treating sewage against the trickling filter fly (*Psychoda alternata*) and water infested with aquatic midges. Clothes moths, bedbugs, and body lice are very susceptible when it is applied as a fumigant. Such agricultural pests as flea beetles, aphids, and hibernating larvae of the codling moth have been controlled with sprays and dusts containing this compound. As a constituent of sprays and paints, it is very useful against pests in stables, chicken houses, empty granaries, etc. It is also useful in fumigating seeds for planting purposes. One of its most promising applications is in insecticidal aerosols for household and stored-products pests. It is also a good solvent and carrier for other insecticidal toxicants, has herbicidal properties, and should prove useful in rodent control.

**Dispersants for aerosols,** L. D. GOODHUE, J. H. FALES, and E. R. McGOVERN. (U. S. D. A.). (*Soap and Sanit. Chem.*, 21 (1945), No. 4, pp. 123, 125, 127).—As a propellant for aerosols used in the presence of man, Freon 12 (dichlorodifluoromethane) appeared the most satisfactory. Other liquefied gases studied as substitutes or diluents for Freon 12 included propane, butane, dimethyl ether, methyl chloride, chlorodifluoromethane, chlorofluoromethane, CO<sub>2</sub> and N<sub>2</sub>O; methylene chloride appeared to be the most practical either as a diluent for Freon 12 or as a solvent for insecticides. This diluent proved practically nontoxic and nonflammable; it is liquid at room temperature, but even with its low volatility it can be substituted for Freon 12 up to a third of its weight without reducing the effectiveness of the aerosol.

**Flea beetles and leafhoppers,** W. M. KULASH (*Res. and Farming [North Carolina Sta.]*, 3 (1945), *Prog. Rpt.* 2, pp. 10, 12).—A practical account.

**A revision of the locusts of the group Hyalopteryges (Orthoptera: Acrididae: Acridinae),** J. A. G. REHN (*Amer. Ent. Soc. Trans.*, 70 (1944), No. 3, pp. 181-231, illus. 43).—New taxonomy and keys for identification are included in this monographic study.

**Descriptions of three new species of *Dactylopsylla* Jordan and one new subspecies of *Foxella* Wagner, with records of other species in the genera (Siphonaptera),** F. M. PRINCE (*Canad. Ent.*, 77 (1945), No. 1, pp. 15-20, illus. 7).—While investigating the distribution of plague in the western United States, the field units of the U. S. Public Health Service have collected several species of *Dactylopsylla* and *Foxella*; among them were three new species of the first genus and a new subspecies of the second, which are described and illustrated. Additional records for these genera are presented.

**A new genus and species of Thripinae from bulbs (Thysanoptera: Thripidae),** J. C. CRAWFORD. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 47 (1945), No.

4, pp. 92-94).—*Bolbothrips asticus* n. gen. and sp.—found living on bulbs of the common tigerflower (*Tigridia pavonia*)—is described from Mexico

New Dolichopodidae from Michigan (Diptera), F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 18 (1945), No. 2, pp. 77-81).—Four new species of flies are described.

New genera and species of muscoid flies, H. J. REINHARD. (Tex. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 18 (1945), No. 2, pp. 67-77).—Descriptions are given of nine new sarcophagine species, including the types of two new genera; all are North American and mainly from Texas.

A new muscoid parasite reared from beetles in California (Diptera), H. J. REINHARD. (Tex. Expt. Sta.). (*Pan-Pacific Ent.*, 21 (1945), No. 1, pp. 11-13).—On *Sarcophaga thyreac* n. sp., here described.

Notes on *Arilus cristatus* (Linnaeus) in York County, Pennsylvania, and on its prey (Heteroptera: Reduviidae), E. T. MOUL (*Ent. News*, 56 (1945), No. 3, pp. 57-59).—Field notes on this reduviid bug in Pennsylvania, including a list of the insect prey.

A bibliography of the Homoptera (Auchenorrhyncha), Z. P. METCALF (*Raleigh: N. C. State Col.*, 1942, vols. 1, pp. 886+; 2, pp. 186).—An annotated bibliography, including a list of periodicals and a topical index.

A revision of the genus *Stragania* (Bythoscopus of authors) in America north of Mexico (Homoptera: Cicadellidae), R. H. BEAMER and P. B. LAWSON (*Jour. Kans. Ent. Soc.*, 18 (1945), No. 2, pp. 49-66, illus. 3).—A key to the species of this leafhopper genus and much new taxonomy are included.

Supplement to food-plant catalogue of the aphids of the world including the Phylloxeridae: Index to genera and species of food plants, A. W. AVERILL (*Maine Sta. Bul.* 393-S (1945), pp. 50+).—This supplementary index is presented to facilitate the use of the bulletin previously noted (E. S. R., 81, p. 679), in which the plant index is restricted to plant families.

On the movement of wireworms of the genus *Agriotes* Esch. (Coleoptera: Elateridae) on the surface of the soil and their sensitivity to light, D. S. FALCONER (*Jour. Expt. Biol.*, 21 (1945), No. 1-2, pp. 33-38, illus. 4).—Wireworms kept in moist sand without food moved about at random; this sometimes brought them to the surface, in which case their responses to light and to lack of contact failed to prevent them from emerging and crawling about on the surface for a considerable time. On the other hand, their response to the humidity of the air prevented their emergence into air of 85 percent (and probably much higher) relative humidity. Though the emergence was conditioned on lack of food, movement on the surface is hardly to be regarded as of a "food-seeking" nature, for the wireworms appeared to have no direct means of locating their food; the point of reentry was determined principally by the ease with which they could burrow. Wireworms were found to be extremely sensitive to light of all wave lengths including the red, the threshold intensity to which they responded being below that required for observing them. An appendix presents data indicating that when there is any possibility of light influencing their reactions, the greatest care must be taken in the technic of experiments dealing with the behavior of wireworms; in one test 14 out of 15 individuals were clearly able to orientate to moonlight and moved away from the source.

On the behaviour of wireworms of the genus *Agriotes* Esch. (Coleoptera: Elateridae) in relation to temperature, D. S. FALCONER (*Jour. Expt. Biol.*, 21 (1945), No. 1-2, pp. 17-32, illus. 13).—The highest temperatures which wireworms could withstand indefinitely without paralysis were found to be 35°-36° C. Resistance to high temperature was not influenced by the previous level; resistance to low temperatures was greatly affected by the rate of reduction, all individuals being killed by 6 days' exposure to -3° or by 4 hours' exposure to -7° when the

temperature fell rapidly. Resistance to low temperature was not increased by previous exposure of 24 hr. at 0°, when the subsequent reduction was rapid; when temperatures were lowered in small stages, however, the resistance was considerably increased, and a few individuals survived for at least a day at -10°. In view of published data on soil temperatures, it is believed that wireworms are not normally liable to encounter lethal temperatures in England. The relation between temperature and speed of crawling was found to be nearly linear at 8°-25°. Burrowing activity was uniformly greater at higher than at lower temperatures at 6°-33°; temperature influenced the speed but not the continuity of the activity. After adaptation, the burrowing activity was almost nil at 6°. When subjected to a sudden fall from 16° to 6°, the burrowing activity in the first 2 hr. was significantly greater than at the same temperature 16 hr. later. The weight of wheat eaten by wireworms was greatest at 32°, but feeding activity was most continuous at about 18°; at 7° or 34° little feeding took place. No vertical movements in response to gravity were exhibited under any temperature conditions tried. When given a choice, the wireworms showed a clear preference for 17° as compared with 11.5°, 21°, or higher temperatures; the preference was not influenced significantly by the previous temperatures. The mechanism by which wireworms reacted to a temperature boundary was of the nature of a "shock reaction," their direction of movement being reversed. No evidence of a klinokinetic response to temperature change was obtained from wireworms burrowing in sand.

The food finding of wireworms (*Agriotes spp.*), W. H. THORPE, A. C. CROMBIE, R. HILL, and J. H. DARAH (*Nature [London]*, 155 (1945), No. 3924, pp. 46-47).—The mechanism by which wireworms in the active feeding phase appear to find so efficiently the crop plants on which to feed was hitherto unknown. To seek the answer, responses in the soil were investigated with two types of apparatus—one which tests the biting reaction and the other a soil choice chamber which tests the ability of the animals to aggregate in solutions or suspensions of test substances in sand or soil. By these methods it was first shown that extracts of potato, carrot, beet, etc., will cause wireworms to aggregate or to bite or both. Further tests seemed to indicate that aggregation and biting are distinct responses and are elicited by different classes of chemical substances. The finding of food in friable soil is believed to be in the main klinokinetic. Wireworms show vertical movements governed by such factors as moisture content, temperature, and season; they also wander at random in the soil, which may carry them into a region where active substances of plant origin are present in quantities above the threshold. When they pass out of this region they show increased turning movements which tend to bring them back into it again. By this means they are kept within the favorable region, where their wandering continues until some substance which releases the biting response is encountered and feeding begins.

External morphology of *Amphimallon majalis* (Razoumowski) (Coleoptera, the European chafer), F. H. BURR ([New York] Cornell Sta. Mem. 266 (1944), pp. 18+, illus. 13).—The detailed information given resulted from studies of the external morphology of the immature and adult stages of this beetle and includes descriptions of the characters of all stages which, to the field worker, are most useful in identification. This introduced pest was first reported in Wayne County, N. Y., in an area of about 140 sq. miles; it has become very destructive to lawns and pasture lands in this region, greatest damage being done by the larval stages. The adults appear early in June and are active for about 6 weeks. The larva is typical of the Scarabaeidae and in appearance is much like the common white grub (*Phyllophaga* sp.), although smaller. The character most useful for field identification is the raster on the ventral side of the last abdominal segment.

A new Javanese Oroclesis and a checklist of the genus (Coleoptera: Curculionidae), E. C. ZIMMERMAN (*Pan-Pacific Ent.*, 21 (1945), No. 1, pp. 17-22, illus. 1).

Notes on *Phyllophaga barda* (Horn) with a description of the larva (Coleoptera: Scarabaeidae), P. O. RITCHER. (Ky. Expt. Sta.). (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 4, pp. 97-99, illus. 3).—Brief notes—including geographical distribution and larval habit—on this rather uncommon May beetle, with a description of the third-stage larva.

On the migration of flea beetles (*Phyllotreta* spp.) (Col.: Chrysomelidae) attacking Brassica crops, B. D. MORETON (*Ent. Mo. Mag.*, 4. ser., 6 (1945), No. 63, pp. 59-60).—Brief field notes are presented, with the conclusion that a knowledge of the way in which weather conditions influence the movements of flea beetles should aid in judging whether a serious infestation of a crop is likely to develop at any time.

Rutelinae of eastern North America with descriptions of the larvae of *Strigodermella pygmaea* (Fab.) and three species of the tribe Rutelini (Coleoptera: Scarabaeidae), P. O. RITCHER (*Kentucky Sta. Bul.* 471 (1945), pp. 19, illus. 34).—A general discussion of the subfamily Rutelinae is included as well as keys to the tribes and to the genera of Anomalini and Rutelini. Descriptions are given for the third-stage larvae of *Cotalpa lanigera* (L.), *Parastasia brevipes* (Lec.), *Pelidnota punctata* (L.), and *S. pygmaea* (F.). The text is supplemented by a bibliography and 34 illustrations.

The bisexuality of uniparental Hymenoptera, a function of the environment, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Amer. Nat.*, 79 (1945), No. 781, pp. 122-141).—The uniparental production of ♀♀ in the Hymenoptera is fairly common; all normal ♂♂ appear to be uniparental. The species fall into two groups, viz, (1) those generally reproducing biparentally, commonly producing uniparental ♂♂ and occasionally uniparental ♀♀; and (2) those reproducing uniparentally but with ♂♂ produced only occasionally, although certain ♀♀ of the group may produce ♂ progeny only. The occurrence of the different types of reproduction apparently depends on a dimorphic condition of the ovaries—ovaries either thelytokous or arrhenotokous. The life histories of certain uniparental species recorded in the literature (over two pages of references) and data from observations on the reproduction of the chalcid parasite (*Habrolepis rouxi* Comp.) of the California red scale indicate that the gonads of the immature ♀ larva, which are potentially thelytokous, may develop into ovaries that are partly or completely arrhenotokous. This may result from a change in the larval nutrition, accompanied by a change in environmental temperature. It is deemed significant that in the species noted the thelytokous condition is associated with relatively low temperatures; the arrhenotokous, with high temperatures. Observations on *H. rouxi* show that thelytoky in the Hymenoptera does not necessarily involve a modification of the meiotic process; it may commonly result from a doubling of the chromosomes in the primary oogonia.

A new genus and species of tetranychid mite from California, E. A. MCGREGOR (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 4, pp. 100-102, illus. 7).—A description of *Monoceronychus californicus* n. gen. and sp. from tufted "saltgrass."

On intraspecific and interspecific competition in larvae of graminivorous insects, A. C. CROMBIE (*Jour. Expt. Biol.*, 20 (1944), No. 2, pp. 135-151, illus. 5).—The ♀♀ of both the lesser grain borer and the angoumois grain moth oviposit in environments containing places suitable for larval development, but the larvae themselves—usually during a period of migration in the first instar—choose the actual developmental site. The rate of oviposition of neither species bears much relation to the amount of food present for the larvae, and the latter do not refrain from multiple or superinfestation of wheat grains. The ensuing competition appears to be wholly a struggle for space. Larvae of any instar attack each other directly after encounters at random within wheat grains, and the supernumerary individuals are either killed or forced to migrate. Except that it tended to favor

survival of *Sitotroga* with atypical developmental rates, overcrowding had no effect on the larvae of either of these species. In an unlimited or unsaturated environment migration may lead to survival, but when the environment is limited in capacity a point will be reached when migration from one grain to another merely leads to death in another place. Migration from the grains tends to decrease with later instars. Because of competition for space the number of larvae of the same age surviving in one grain is less than that which the food present in the latter could support. This number (about 1.2 per grain) does not vary with density, so that the relationship between survival and larval density is expressed by an equation.

When the two species are competing, the average ratio of survivors is *Rhizopertha* to *Sitotroga* as  $1.3r:s$ , where  $r$  and  $s$ , respectively, are the initial numbers of larvae of each species. These represent the proportions of the 1.2 larvae surviving per grain which belong to each species. This ratio remains constant at all densities when the larvae enter the grains at the same time in the same instar. Each species thus decreases the probability of survival of the other in direct proportion to its own numbers. When the first-instar larvae of the two species enter the grains at different times the above relationship changes in favor of the first comer. The most unfavorable time for the second species to enter is apparently when the first is in the second or early third instar. With greater differences between times of entry (i.e., of age) the severity of competition for space decreases, so that more larvae are able to survive and take advantage of the food reserves of the grain. *Sitotroga*—but not *Rhizopertha*—took advantage of this decreased competition because of the occurrence of larvae with atypical developmental rates in this species. The latter survived the competition of normal larvae of either species where other normal larvae would have succumbed. Crowding to a certain degree tended to increase the proportion of atypical larvae among the survivors of this species. Overcrowding in the immature stages had no effect on the average developmental period of the larvae, or on the sex ratio, weight, or fecundity of the adults of either species. There are 53 references.

*Observaciones sobre el pulgon verde de los cereales y su parasito "Aphidius platensis" en Santa Fe [Observations on the green bug of cereals and its parasite A. platensis in Santa Fe, Argentina], M. GRIOT (Rev. Argentina Agron., 11 (1944), No. 4, pp. 309-319, illus. 2).*

*Autographa egena* (Guen.), a periodic pest of beans in California, W. H. LANGE, JR. (*Pan-Pacific Ent.*, 21 (1945), No. 1, p. 13).—The caterpillars are reported to feed on the leaves and green pods and seeds of beans, especially the pole types; in some instances almost complete defoliation resulted.

Progress in controlling the European corn borer, R. H. WILEMAN. (Ind. Expt. Sta.). (*Agr. Engin.*, 25 (1944), No. 11, pp. 419-420, illus. 4).—The author briefly reviews the present status of control work on this pest—the major proportion of such research being along plant breeding and entomological lines—and summarizes progress in the active agricultural engineering projects for borer control at the Indiana Station; these include work with light traps, but particular attention is called to the successful results of plowing under, the high effectiveness of a hammer-type stalk pulverizer developed for attachment to the picker and here described in some detail, and the influence of soil type and time and depth of burial on the percentage of borers emerging or coming to the surface after plowing. Contrary to expectations, the data showed a lower emergence of larvae from light than from heavier soils; as to time of burial, two and a third times as many borers came to the surface after early spring plowing as when it was done in late fall or late spring. The data as a whole indicate the necessity for clean plowing to secure effective corn borer control; whenever possible cornstalks should be plowed under in late fall or late spring rather than early in the spring.

**Studies on the control of beet webworm *Hymenia recurvalis* (Fabricius), F. G. HOLDAWAY and W. C. LOOK (Hawaii Sta., Prog. Notes No. 41 (1944), pp. 10).**—In three experiments on the control of the beet webworm *H. recurvalis* on beets, pyrethrum dusts with 0.2 percent pyrethrins have consistently given excellent control (81–100 percent) and that by means of a commercial dust has been outstanding—in general 99–100 percent. Pyrethrum dusts have also given consistently excellent results against the bean leafhopper *Empoasca solana* DeLong. Furthermore, when the broad mite was present, pyrethrum-sulfur dusts gave satisfactory control of the webworm and bean leafhopper and excellent protection of the foliage against injury by this mite. Pyrethrum sprays at the strengths used were less effective than the dusts against beet webworms. In another test, sulfur-bentonite dust produced 90.1 percent control of webworms; sulfur dust alone, 77.7 percent control. Nicotine dusts (talc and nicotine sulfate or talc and free nicotine) appeared promising against webworms, control with these two formulas being 87.4 and 86.3 percent, respectively.

**The West Indian sugarcane fulgorid in Louisiana and Mississippi, J. W. INGRAM and E. K. BYNUM. (U. S. D. A.). (Sugar Bul., 23 (1945), No. 13, pp. 101, 102).**

**Fighting khapra in the Punjab, K. A. RAHMAN (Indian Farming, 5 (1944), No. 6, pp. 272–275).**—On the control of insect pests—including *Trogoderma khapra*—of stored wheat.

**Control of insects attacking State's major truck crops, E. L. MOORE and C. LYLE (Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 3, p. 6).**—A practical account.

**DDT, a new insecticide for vegetables, J. C. RUSSELL. (Fla. Expt. Sta.). (Fla. State Hort. Soc. Proc., 57 (1944), pp. 208–210, illus. 3).**—The author reviews the results of 1 year's tests of DDT against certain vegetable insects, including those attacking cabbage, celery, fall snap bean, and sweet corn.

**Codling moth control with DDT, 1944, L. CHILDS and R. H. ROBINSON. (Oreg. Expt. Sta.). (Oreg. State Hort. Soc. Ann. Rpt., 36 (1944), pp. 73–78).**—The experimental work now under way is said to indicate very clearly that DDT is definitely effective against the codling moth and numerous other agricultural pests. "In fact it is the most outstanding material that we have used in codling moth investigational work that extends over a period of more than 30 years. . . . However, there are many unknowns involved because of limited usage to date." Some of these unknowns are the proper dosage to use, the effect on man, injury to fruit and foliage, and various biological upsets such as the killing of beneficial as well as injurious insects.

**Experiments with DDT for codling moth, L. F. STEINER, S. A. SUMMERLAND, and J. E. FAILEY. (U. S. D. A.). (Va. Fruit, 33 (1945), No. 3, pp. 1–22).**—The new insecticide DDT has been extensively tested against codling moth at Vincennes, Ind., during 1943–44. The results may be summarized as follows: In a large-scale test DDT sprays at 1 lb. per 100 gal. were more effective than the standard nicotine bentonite program, and in small-plot field tests at the same strength it gave much better control than the standard lead arsenate program. DDT is a very effective supplement when added in small amounts to lead arsenate or nicotine bentonite and can be used in split schedules ahead of or following these sprays. It can also be used effectively with summer oils and bordeaux. Owing to variations in the physical properties of different lots of DDT received for testing, the results have varied considerably; much remains to be done to develop formulations most suitable for codling moth sprays. At certain dosages in the required range for codling moth control, DDT is very toxic to important predators of the European red mite and the common red spider; under favorable weather conditions in DDT-sprayed plots the mite populations have built up to extremely destructive

levels in record-breaking time. DDT is very effective against leafhoppers and has shown promise in controlling several species of apple aphids. Much more experimental work must be done before general adoption of DDT by growers can be recommended.

**Role of the wetter in apple sawfly control,** G. A. CARTER and C. H. HARDY (*Agriculture, Jour. Min. Agr. [Gt. Brit.], 51 (1945), No. 12, pp. 563-566*).—In the experiment reported, addition of a wetter to the nicotine wash improved the control of *Hoplocampa testudinea* Klug; it was also shown that there is a concentration of wettener beyond which no further improvement in control is to be obtained.

**Control of the strawberry crown borer by methyl bromide fumigation and with poison baits,** P. O. RICHTER (*Kentucky Sta. Bul. 468 (1941), pp. 28, illus. 10*).—The equipment, use, and results of the two new methods are presented. The safest dosage of methyl bromide for commercial use was found to be 3 lb. per 1,000 cu. ft. for 2 hr., at chamber temperatures of 65°-83° F. and at load temperatures of 65°-75°. With this dosage there was complete mortality of the adults, eggs, and larvae, with no plant injury. The two poison baits tried were effective in killing adult borers whether feeding on strawberry or cinquefoil foliage. One bait was a commercial preparation made of dried chopped apple refuse coated with 3.5 percent of sodium fluosilicate; the other was made of dried chopped apple pomace coated with 2.5 percent of lead arsenate. In one field test baiting reduced subsequent infestation of mother plants by over 80 percent.

**Insect pollination of orchard fruits,** W. E. DUNHAM (*Ohio Sta. Bimo. Bul. 233 (1945), pp. 45-48*).—A practical account.

**Progress report on purple mite and its control,** W. L. THOMPSON. (*Fla. Expt. Sta. (Fla. State Hort. Soc. Proc., 57 (1944), pp. 98-110, illus. 1)*).—The history of the citrus red mite in Florida is presented, the insect is described, its life history and seasonal history are briefly discussed, and the experimental work on its control is summarized. The damage caused in the State is said to be of real consequence. In the studies at the Citrus Experiment Station many materials were tested in a preliminary way, but only a few of the most promising have been subjected to extensive testing. Lime-sulfur has been used for years, but more recently has not proved satisfactory. An oil emulsion spray is said to have been as effective and economical as any of the materials tested, especially when it is considered that it also reduces infestations of scales, white flies, and rust mites to a certain extent. Dinitro-o-cyclohexyl phenol (DN) has proved a satisfactory material for red mite control, and its use in various combinations of sprays and dusts is discussed. DN-Dry Mix is said to be compatible with the neutral coppers, and combinations of DN, neutral copper, and wettable sulfur have proved satisfactory. Another desirable combination spray with DN is the dormant nutritional zinc-sulfur spray. In general, DN has been found most effective with wettable sulfur, next in a combination neutral copper-wettable sulfur spray, and least effective when combined with zinc sulfate, hydrated lime, and wettable sulfur. DN should not be used on very succulent foliage. At present only suggestions can be made for a complete yearly program, but it appears that at least two treatments, excluding the summer oil, will be necessary for control through the year.

**Summary of field experiments with DDT and rotenone used in red scale control,** W. EBELING. (*Calif. Citrog., 30 (1945), No. 6, pp. 164, 193, illus. 1*).—

The cactus moth *Melitara dentata* (Grote) and its effect on *Opuntia macrorhiza* in western Kansas, R. E. BUGBEE and A. REIGEL (*Amher. Midland Nat., 33 (1945), No. 1, pp. 117-127, illus. 9*).—The insects attacking cactus have received considerable attention from the U. S. Department of Agriculture, and its field

observations during the past few years indicate that insect damage has reduced cactus stands on ranges in western Kansas and eastern Colorado. Observations made by staff members of Fort Hays Kansas State College (1940-41) gave evidence that insects had killed many clumps of cactus, and short grass was growing over the dead pads. In the fall of 1942 the authors began studying the life history of one of these insects, *M. dentata*, in response to a request from the Department for information on its distribution and prevalence in western Kansas. A summary of the results of a year's study are here presented. No figures can be given as to the actual value in combating cactus, but it is estimated that this insect has reduced the stands by 50-75 percent or more in areas observed around Hays. Given adequate cover plus rainfall, it is believed that the larvae can serve as a very material check on the pricklypear cactus in the short grass range lands. Their apparent wide range of adaptability to climatic conditions further assures that even though periods may be unfavorable they will survive, and soon again be strong enough in numbers to serve as a potent check.

**Notes on redwood cerambycids (Coleoptera), J. W. TILDEN** (*Pan-Pacific Ent.*, 21 (1945), No. 1, pp. 30-31).—Brief notes on these beetles attacking the redwood trees in California.

**The biology and behavior of *Ptinus tectus* Boie (Coleoptera: Ptinidae), a pest of stored products.**—V, Humidity reactions, E. W. BENTLEY (*Jour. Expt. Biol.*, 20 (1944), No. 2, pp. 152-158, illus. 8).—In further work (E. S. R., 89, p. 241), *P. tectus* adults reacted to a humidity gradient by collecting in the drier region. The reaction to a given difference was most intense at low humidities; it declined to nothing at about 75-90 percent relative humidity and increased again at 90-100 percent. It is said that no such variation has been found previously. A kinetic mechanism of reaction is involved; the higher the humidity the greater the locomotor activity over a weekly period. The desiccated insects were more active than normal ones. At low humidities they exhibited a much weakened reaction toward dry air; at high humidities the normal reaction was reversed and they collected in the wetter region. When desiccated individuals were given water they immediately began to behave like normal ones. Some of the humidity receptors appeared to be located in the antennae. Removal of the distal joint increased the intensity of reaction at high humidities, but the interpretation of this result is considered questionable. The reaction remained strong when up to five joints were amputated, and then it declined. When only one or more of the last three joints remained, a reversed reaction occurred—similar to that in desiccated individuals. This suggested that there are two kinds of humidity receptors, the first being mainly located distally on the antennae and some of the second kind being either on the basal joint or not on the antennae at all. Attempts to identify humidity receptors were unsuccessful.

**Roach repellent cement, F. O. HAZARD** (*Soap and Sanit. Chem.*, 21 (1945), No. 4, pp. 129-135, 157, illus. 1).—Gray-colored Hubbellite was found to possess a marked degree of repellency against German, American and Oriental cockroaches. When the Hubbellite half of the test chamber was supplied with food and water, repellency was obtained there even in the absence of food or water—or both—on the portland cement half. Red, brown, and green Hubbellite were equally repellent to German and American cockroaches, but less so against the Oriental species. Hubbellite did not show toxic properties to the German cockroach. These findings should prove of interest in connection with flooring—especially for rooms or buildings used for food storing, selling, and servicing.

**Insect pests of stored grain in the United Provinces and their control, K. B. LAL** ([India] *United Provs. [Dept. Agr.] Bul.* 91 (1944), pp. 9+, illus. 8).

**Insect repellency testing: The testing of fabrics and papers for attractiveness to Thysanura and roaches before and after deterrent applications, H.**

SWEETMAN, C. L. WARNER, and B. J. HERSHBERG. (Mass. State Col.). (*Soap and Sanit. Chem.*, 21 (1945), No. 3, pp. 104-107, 127, 129, 131, illus. 7).—Experimental data and practical procedures for determining the readiness with which thysanurans, roaches, and other insects with similar food habits will feed on fabrics or papers are presented.

Petroleum oils used by pest control operators, G. L. HOCKENYOS (*Soap and Sanit. Chem.*, 21 (1945), No. 3, pp. 109-117, 141, illus. 1).—Included in this discussion are the specifications and terminology of base oils for bed bug sprays, by B. L. Patton (pp. 109-115).

On the measurement and modification of the olfactory responses of blowflies, A. C. CROMBIE (*Jour. Expt. Biol.*, 20 (1944), No. 2, pp. 159-166, illus. 4).—The accuracy of control of the olfactory stimulus was tested by balancing olfactory and visual stimuli of different intensity in the two species *Calliphora erythrocephala* and *Lucilia sericata*. This demonstrated that a reasonably accurate control of the intensity of the olfactory apparatus was achieved and also disclosed some facts about the quantitative relationship of stimulus to response. These flies are normally repelled by menthol, but their response to the odor of this substance was modified when they first experienced it in the larval stage or immediately on emergence. The memory of an experience in the larval stage thus survives metamorphosis and affects adult behavior. Most of the flies became "habituated" to the odor, but in one case they appeared to have become "conditioned"—possibly a case of "latent learning." There was no modification of the response of adults which first experienced the odor at several days of age. The populations of habituated or conditioned flies were not homogeneous. Different samples of populations which appeared at first to be indifferent to the odor often proved to respond differently, some being repelled, others indifferent or even attracted to this odor.

Two new trombiculid mite larvae (chiggers) from Burma, H. E. EWING. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 3, pp. 63-65, illus. 1).

The bite of a lacebug, *Corythucha cydoniae* (Fitch) R. I. SAILER. (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 18 (1945), No. 2, pp. 81-82).—Report of a case in which the skin was pierced by the stylet of a lacebug.

The mosquitoes of New Jersey and their control, T. J. HEADLEE (*New Brunswick: Rutgers Univ. Press*, 1945, pp. 326+, illus. 88).—"There is included in this book such information about mosquitoes, their description, life histories, breeding places, food, natural enemies, and control as to furnish scientific investigator and practical mosquito worker alike with fundamental information necessary to a proper understanding of mosquitoes and their control. While the subject matter of this publication is primarily scientific, it is intended to be of value not only to teacher, student, and those engaged in practical mosquito work but to the lay reader as well."

A new species of *Aedes* from Saipan and the larva of *Aedes pandani* (Diptera: Culicidae), A. STONE. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 3, pp. 65-69, illus. 2).

New mosquito hosts for *Plasmodium gallinaceum*, W. CANTRELL and H. B. JORDAN (*Jour. Parasitol.*, 31 (1945), No. 1, pp. 55-56).—This report includes the results of observations on two American species that have and seven that have not been previously studied. The findings are in accord with those of other workers in that no species of *Aedes* has been found that is insusceptible to *P. gallinaceum*. The new hosts are *A. campestris* Dyar, *A. stimulans* Walker, *A. triseriatus* Say, *A. trivittatus* Coq., *Culex salinarius* Coq., *Mansonia perturbans* Walker, and *Theobaldia inornata* Williston.

**Recording of sounds produced by certain disease-carrying mosquitoes**, M. C. KAHN, W. CELESTIN, and W. OFFENHAUSER (*Science*, 101 (1945), No. 2622, pp. 335-336).—The authors report the successful recording of mosquito sounds which are faintly audible or completely inaudible to the human ear, with the end in view of calling specific varieties of mosquitoes to a place of destruction. Certain species such as the yellow-fever mosquito have been thought to produce little if any sound; this study showed that they do produce sounds, but outside the range of human hearing. Each genus and species were found to have tonal emanations so distinctive in character that an experienced observer not only can readily distinguish one genus from another, but with no difficulty can also differentiate the ♂♂ from the ♀♀ of the same species. Other species involved in these tests were the common malaria mosquito, the northern house mosquito, and *Aedes albopictus*. It is suggested that possibly this method may become of aid in the destruction of other insects as well as rats and other rodents concerned in disease transmission.

**DDT-Thanite sprays for mosquitoes**, P. L. RICE, C. B. HUFFAKER, and R. C. BACK. (Del. Expt. Sta.). (*Soap and Sanit. Chem.*, 21 (1945), No. 3, pp. 119, 121, 146, illus. 2).—The experiments summarized indicate that the DDT-Thanite combinations used may find considerable application as substitutes for pyrethrum in liquid mosquito sprays and suggest further trials with them as aerosols.

**Entomological problems in malaria control**, G. H. BRADLEY (*Jour. Natl. Malaria Soc.*, 4 (1945), No. 1, pp. 1-8).—An address summarizing the problems concerning the anopheline mosquito vector control.

**The relation of plants to malaria control on impounded waters, with a suggested classification**, A. D. HESS and T. F. HALL (*Jour. Natl. Malaria Soc.*, 4 (1945), No. 1, pp. 20-46, illus. 2).—This paper—presented before the annual meetings of the National Malaria Society—considers the classification of plants in relation to malaria control, including definitions of the groups included; contour zonation of plant types; anopheline production potentials of plant types; plants in which propagation of the common malaria mosquito does not occur; relation of microscopic plants to anopheline production; relation of plant types to reservoir preparation, water-level management for malaria control, shore-line maintenance, and application of larvicides; and the current status of plant types in the reservoirs of the Tennessee Valley Authority. There are 23 references.

**Contribución al estudio de la entomología médica del Estado Falcón [Contribution to the study of medical entomology in the State of Falcon, Venezuela]**, I. ORTIZ C. (*CIn. "Luis Razetti" Lab. Bol.*, 4 (1944), No. 14, pp. 247-251).—Brief consideration is given to insects of the following families: Triatomidae, Simuliidae, Heleidae (Ceratopogonidae), Psychodidae, Culicidae, and Tabanidae.

**Distribution and hosts of certain North American ticks**, F. C. BISHOP and H. L. TREMBLEY. (U. S. D. A.). (*Jour. Parasitol.*, 31 (1945), No. 1, pp. 1-54, illus. 18).—The importance of ticks as transmitters of disease and as parasites and annoyers of man and animals made desirable the assembling of information on their geographical and seasonal distribution, and especially on their host relationships. Over the past 35 yr. representatives of the U. S. Department of Agriculture have collected specimens of ticks from many parts of the United States and with the aid of correspondents have assembled numerous lots of these parasites with appropriate collection data. In this monograph the formal data are based on the collections of the Bureau of Entomology and Plant Quarantine, but reference is made here and there to distribution and host records not represented in the Bureau files. Maps are used to indicate distributions of the more important and numerous species, both from the Bureau collection records and from records published by others (61 references). Hosts are referred to by common names, but a list of their scientific names is given at the conclusion of the paper.

**Pasture management kills lone star ticks,** R. W. PORTMAN (*Missouri Sta. Cir.* 297 (1945), pp. 4, several illus.).—Information is presented on how a knowledge of the life history of these ticks enables their reduction to a minimum by starvation through pasture management practices.

**The influence of various physical and biological factors of the environment on honeybee activity: An examination of the relationship between activity and nectar concentration and abundance,** C. G. BUTLER (*Jour. Expt. Biol.*, 21 (1945), No. 1-2, pp. 5-12, illus. 5).—Irrespective of its sugar concentration, as the amount of nectar of a given plant species becomes smaller the number of bees working it is also reduced. This is not due to desertion by the old bees in favor of a more profitable crop, but rather to their natural death along with the fact that their places are not taken by new bees. Young foragers are not attracted to the crop concerned because its presence is not communicated to them by the old bees still working on it. The range of nectar concentration (percentage total carbohydrate) in the flowers of many plant species in a given district varies from day to day and even from hour to hour; it is almost certain that such changes arise directly through fluctuations in atmospheric humidity. These changes are greatest in flowers with relatively unprotected nectaries. Honeybees respond to the concentration of nectar secreted, working in greatest numbers on plants having flowers with the highest nectar concentration. When two or more species of "bee plants" are in flower simultaneously, the species attracting the most bees is the one in which the nectar is most highly concentrated. This accounts for the occasional failure of honeybees to work the flowers of fruit trees when other flowers are available. Both abundance and concentration of nectar appear to have considerable effect on honeybee activity. From present data it appears correct to conclude tentatively that nectar concentration decides in the first instance which species will be visited in preference to others flowering at the same time, and that nectar abundance then determines the proportion of the foraging population of a colony which will work the flowers in question.

**Is there a real pollen substitute?** M. H. HAYDAK. (Minn. Expt. Sta.). (*Gleanings Bee Cult.*, 73 (1945), No. 4, pp. 126-128).—From the recent experimental results (1944) described, it is evident that dried skim milk was about equal to pollen as a supplement to soybean flour, while dried brewers' yeast was about twice as effective as either the dried skim milk or pollen. Although the pollen supplement resulted in production of a smaller number of sealed cells, the brood-rearing activity of the bees was nearer normal than that in colonies fed the dried skim milk mixture. At the end of the second and third 10-day periods there were about four times as many sealed cells in pollen-fed colonies as in those fed the dried skim milk mixture, meaning that four times as many larvae reached the sealing stage in the pollen supplement-fed colonies as in those fed dried skim milk-soybean flour mixture. The final results, however, were equal for both groups. Colonies fed on the dried brewers' yeast-soybean flour mixture reared brood normally, just as in the colonies outside. In these tests it is quite evident that the latter mixture was a very efficient pollen substitute. Detailed directions and formulas are given on the basis of these findings.

**The importance of honey production during war time,** R. L. PARKER. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 47 (1944), No. 2, pp. 191-193).

**The avoidance of bee poisoning,** J. E. ECKERT. (Univ. Calif.). (*Gleanings Bee Cult.*, 73 (1945), No. 4, pp. 129-131, 175).—Because of the prevalence of bee diseases and the destructive effects of chemical poisoning the small farm apiary has largely disappeared; the destruction of bee colonies is thus as serious a problem for the general agriculture of a community as it is for the bee specialist. This paper presents a discussion as to how bees secure the poisons, sources of

the poisons, and some possible solutions. As to the last, it is concluded that the most effective way would be through legislation to prevent the improper use of agricultural chemicals, making it a misdemeanor to apply materials toxic to bees to fruit trees in bloom or by such means or under such conditions as would cause them to be deposited on adjacent property in quantities injurious to honeybees, livestock, and other property; if this were done, it is believed that 90 percent of the losses now suffered would be prevented.

## ANIMAL PRODUCTION

**Cooperation in animal husbandry research**, R. E. BUCHANAN. (Iowa Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 87-95).—The formulation of the regional laboratories, particularly those with different classes of animals, is briefly reviewed, and the general objectives of the laboratories with swine, sheep, poultry, and diseases are set forth. "Cooperation in animal husbandry research on regional and national bases is well under way. Cooperation is reasonably adequate in some areas; more is desirable in others. Many agencies other than animal husbandry are involved."

**Advantages and limitations of the regional laboratory method of approach**, H. J. REED. (Purdue Univ.). (*Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 98-103).—The regional laboratories are so established as to enable workers to attack the many phases of regional problems with each type of livestock, and the coordinated attack on a similar problem has benefited both workers and the public in the region. However, the value of the regional laboratory may be limited if its activities are too highly centralized. Experiment station representation aids in broadening the program.

**Accomplishments of the regional animal research laboratories**, H. C. MCPHEE. (U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 96-97).—The author points out that the four regional animal research laboratories—the Regional Animal Disease Laboratory at Auburn, Ala.; the Regional Poultry Research Laboratory at East Lansing, Mich.; the Regional Swine Breeding Laboratory at Ames, Iowa; and the Western Sheep Breeding Laboratory at Dubois, Idaho—have made significant and definite progress with domestic animals, although this is inevitably slow. The output of tangible results should continue to expand in the future as a result of the cooperative efforts.

[**President's address at the thirty-seventh annual meeting of the American Society of Animal Production**], L. A. WEAVER. (Univ. Mo.). (*Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 72-76).—This address reviews in brief the progress of the society since its inception.

**The amino acids in nutrition** (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 817, pp. 229-235, illus. 2).—A review of the dispensable and indispensable amino acids in nutrition from the pioneer studies of Osborne, Mendel, and Ferry (E. S. R., 28, p. 864) to the present is presented by the committee on nutrition of the American Veterinary Medical Association.

**Further studies on the stabilization of carotene in dehydrated alfalfa and cereal grasses**, R. C. MILLS and E. B. HART. (Univ. Wis.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, p. 339).—Continuing the study previously noted (E. S. R., 92, p. 821), it appears that the surface of the pellet in reference to the mass of material is of great importance in effecting a stabilization of carotene during storage. After autoclaving in the absence of air and drying, alfalfa and cereophyl were stored in the dark at room temperature for 3 mo. Samples were made into pellets  $\frac{1}{2}$  by  $\frac{1}{2}$  in., and into larger pellets 4 by 3 in., with the small pellets dipped in Flexowax. Alfalfa left loose lost 50 percent of its carotene in 3 mo., the

cerophyl 56 percent. The small or large pellets of alfalfa lost in the same time about 36 percent, and the cerophyl about 56 percent. The small alfalfa pellets in Flexowax lost 36 percent and the cerophyl 25 percent. The larger alfalfa pellets dipped in Flexowax lost 28 percent and the large cerophyl Flexowax pellets from none to two percent of their carotene in 3 mo.

The Texas feed law: Definitions, standards, and regulations relative to feeding stuff, F. D. BROCK (*Texas Sta. Cir.* 106 (1944), pp. 35).—Definitions and standards for commercial feeds and methods of calculating guaranteed analyses are presented.

The use of silica as a reference substance in digestion trials with ruminants, W. D. GALLUP, C. S. HOBBS, and H. M. BRIGGS. (Okla. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 68-71).—Representative samples of feeds and aliquots of the total feces from steers and sheep were collected for proximate analysis and determinations of the proportions of silica in the samples. In general, the results indicated that under favorable conditions the silica ratio procedure (E. S. R., 75, p. 820) seems adaptable to digestion studies.

Productive energy of feeds, G. S. FRAPS. (Tex. Expt. Sta.). (*Flour & Feed*, 45 (1945), No. 12, pp. 16, 18).—Emphasis is placed on the importance of the protein content of rations in the calculation of energy values of feeds as was done in Texas Experiment Station Bulletin 665, noted on page 334.

Feeding and grazing experiments with beef cattle, A. E. DARLOW ET AL. (*Oklahoma Sta. Mimeog. Cir.* 136 (1945), pp. 28+, illus. 1).—The following papers are presented: Utilization of Bluestem Grass in Maintaining the Commercial Cow Herd, by Darlow, B. R. Taylor, V. G. Heller, W. D. Campbell, and J. C. Hillier (pp. 2-5); The Value of a Mineral Supplement in Wintering 2-Year-Old Steers on Bluestem Grass and 41 Percent Soybean Cake, by Darlow, Taylor, Heller, Campbell, and J. A. Hoefer (pp. 6-8); Supplements for Fattening 2-Year-Old Steers on Bluestem Grass—1944 Grazing Season, by Darlow, Heller, Taylor, and Campbell (pp. 9-12); Summer Gains of Yearling Steers Wintered at Different Levels, by Darlow, Taylor, and Campbell (pp. 13-15); How Well Should Steer Calves be Wintered? by Darlow, Campbell, Heller, and H. M. Briggs (pp. 16-18); Dried Sweet Potatoes and Ground Wheat as a Substitute for Corn in Rations for Fattening Steer Calves, by Darlow, Campbell, F. B. Cross, Heller, and Briggs (pp. 19-21); Yield and Feeding Value of Prairie Hay Cut at Different Stages of Maturity, by Briggs, W. D. Gallup, and Darlow (pp. 22-24); and Urea as a Partial Protein (Nitrogen) Supplement for Beef Cattle, by Briggs, Gallup, Darlow, D. F. Stephens, Hoefer, and Campbell (pp. 25-28).

Fattening yearling cattle in the Appalachian region, W. H. BLACK and C. V. WILSON. (Coop. W. Va. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul.* 889 (1945), pp. 11, illus. 3).—In each of 3 yr., groups of steer and heifer calves from high-grade Hereford cows and purebred Hereford bulls were fattened for about 100 days. During each year four groups were fattened as follows: A group of steers on bluegrass and ground shelled corn; a second group of steers on bluegrass and a mixture of 8 parts of ground shelled corn and 1 part of protein concentrate (equal parts of cottonseed meal and linseed meal); a group of heifers on bluegrass and ground shelled corn; and a second group of heifers on ground shelled corn and alfalfa hay in dry lot. The cattle were marketed at 15-17 mo. of age. The calves averaged about 7½ mo. of age when weaned and were placed on the winter feed 1 mo. later, at which time the steers averaged 500 lb. and the heifers 445 lb. in live weight.

On pasture the steers consumed an average daily ration of about 8.13 lb. concentrates per head, and about 1 lb. less was consumed by the heifers. Ample bluegrass pasture was available so that the cattle got their fill in a comparatively

short time. The heifers fattened in dry lot consumed the same average quantity of corn per day—7.12 lb.—as the heifers fattened on grass and corn, but they ate 10.16 lb. of alfalfa hay instead of grass. Replacing 1 lb. of corn in the steer ration by an equal amount of mixture of the protein feeds increased the gain slightly but at a greater cost, but at the prevailing prices the increased gain more than offset the additional cost. The carcass score was increased by about one-third of a grade by the addition of the protein concentrate. Although these differences were not statistically significant, they may be of considerable importance to the producer and may indicate a profit rather than a loss from the feeding operations.

The results of the experiments also show that after heifers have been well wintered it is better practice to fatten them on grass with a grain supplement than to feed them in dry lot with alfalfa hay and the same grain supplement. The 3-yr. averages indicate that the heifers make better and more economical gains with pasture than in dry lot. Where good pasture is available, well wintered steers and heifers may be put into good marketable condition at about 16 mo. of age, with concentrates and grass for about 100 days during the first half of the grazing season. Steers may be expected to make slightly greater gains than heifers because of the greater feed consumption, and to show a little more finish together with a slightly increased dressing percentage.

Some factors that influence the production of steers from pasture, C. M. KINCAID, G. W. LITTON, and R. E. HUNT. (*Va. Expt. Sta.*). (*Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 164-173).—The effects of three factors (age of feeder, rate of gain during winter, and method of grazing) on the gain in weight and carcass grade of steers fattened on pasture were measured by a factorial design in accord with the methods described by Yates (E. S. R., 79, p. 469). These results showed that there was no significant difference in the gains of yearling and 2-year-old steers, but that the latter were significantly fatter (one-fourth carcass grade). Each pound of winter gain reduced summer gain by 0.58 lb. and increased annual gain 0.42 lb. Increasing the acreage from  $1\frac{1}{3}$  to  $3\frac{1}{3}$  acres per steer increased the gains 19.6 lb. for each extra acre. There was no advantage in gains from withholding steers from part of the pasture until July 1.

The adjusted mean squares reduced the error by 14 and 12 percent for summer gains and carcass grades, respectively. Variance within the treatments may be reduced and precision increased by individual feeding. "The factorial was more efficient in the use of facilities and provided data which had wider application to practical conditions than would have been the case with a series of single factor experiments. Making the same number of steers answer three questions and also the interactions between them gave information on each question only 3 percent less precise than if the same steers had been used to answer one of these questions alone." The two ages of steers averaged  $738 \pm 7$  and  $970 \pm 10$  lb., respectively, at the start. Three feeding levels were tested in winter feeding with the idea of maintenance and 50 and 100 lb. gain. There were six steers in each lot, one from each of the age-winter feed groups, i. e., each of the pasture lots contained steers representing all possible combinations of the other two factors.

Feeding distillers' dried grains to growing and fattening cattle, M. L. BAKER (*Nebraska Sta. Bul.* 374 (1945), pp. 12).—In four experiments of which two were with steer and heifer calves and two with yearling heifers, distillers' dried grains were found to be worth approximately as much as soybean meal on an equivalent crude protein level. There was no advantage in feeding distillers' dried grains at a higher level than that necessary to supply the same crude protein level as that provided by the soybean meal or with a combination of soybean meal and distillers' dried grains. There were indications in tests with fattening yearling heifers that combinations of soybean meal and distillers' dried grains were superior to

soybean meal alone when fed on an equivalent crude protein basis. The composition, digestibility, and palatability of distillers' dried grains, and consequently their feeding value, may vary considerably. In these experiments, 16 lots of cattle consisting of 10-14 head were fed 88-140 days on rations consisting of concentrates of various combinations of soybean meal and no distillers' dried grains to combinations in which the concentrates consisted only of shelled corn and distillers' dried grains. Sorgo silage made up the roughage in one of the experiments, with corn silage making it up in the other three. Carcass grades and dressing percentages are presented for the cattle in the last two trials.<sup>1</sup>

**Distillery slops for fattening steers,** W. H. BLACK, N. R. ELLIS, and W. P. GARRIGUS. (U. S. D. A., Ky. Expt. Sta., et al.). (*Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 158-163, illus. 2).—Groups of 10 long yearling well-bred Hereford steers were satisfactorily fattened on slop made from three mashes of granular wheat, whole wheat, and equal parts of corn and wheat with about 5 lb. of lespedeza-grass hay per head daily. During the first 168 days the average daily gains per head on these rations were, respectively, 1.69, 2.00, and 1.93 lb. and for 224 days 1.50, 1.70, and 1.45 lb. The steers in three lots averaged about 700 lb. at the start, and it is suggested that the feeding period should not extend beyond approximately 180 days. In cattle-feeding areas adjacent to distilleries, distillery slop may contribute materially to the potential beef supply. In wartime, when mash of the feed supplies commonly used for beef production is diverted to other channels, the efficient utilization of distillery slop is especially recommended. The study was made in cooperation with a distillery, which furnished the steers. The average carotene content of the hay was 101.5 µg. per 100 gm. The daily intake of carotene in the hay was estimated as approximately six times that in the slop from granular wheat and one and one-half times that from the corn and wheat mixture.

**The effect of sex on weaning weight of range calves,** M. KOGER and J. H. KNOX. (N. Mex. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 15-19).—The mean weaning weights corrected for age differences at weaning of 800 calves for 8 yr. (1936-43) averaged 443 lb. for 419 steers and 416 lb. for 414 heifers, all sired by 12 bulls. Sex differences were shown in the progeny from each sire.

**The nutritive value of South African feeding stuffs.—II, Digestible nutrients and metabolizable energy of lucerne hay at different planes of intake for sheep,** J. G. LOUW (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 20 (1944), No. 1, pp. 85-95).—Continuing this series,<sup>1</sup> the digestibility and metabolizable energy content of alfalfa hay were determined with each of five mature Merino wethers at daily levels of intake—600, 800, and 1,000 gm.—in the different tests. Differences in the coefficients of digestibility and metabolizable energy for the alfalfa hay in the first and third groups were in general insignificant, but the hay fed in the second group was digested significantly better and contained more metabolizable energy than the hay fed in either of the other two periods. The differences are considered to have been caused chiefly by differences in chemical composition—protein, cellulose, and lignin contents—of the alfalfa hays consumed in the several periods.

**Prevention and cure of muscular stiffness ("stiff-lamb" disease) in lambs,** J. P. WILLMAN, J. K. LOOSLI, S. A. ASDELL, F. B. MORRISON, and P. OLAFSON. (Cornell Univ.). (*Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 128-132).—The results of several experiments have indicated that the stiff-lamb disease may be caused by the lack of vitamin E and that it may be prevented by feeding an oil solution of *d,l*- $\alpha$ -tocopherol acetate. Six of seven stiff lambs recovered following the subcutaneous injection of a water solution of the disodium salt of *d,l*- $\alpha$ -tocopherol phosphoric acid ester, while five of six untreated stiff lambs died. Earlier work

<sup>1</sup> *Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 18 (1943), No. 1-2, pp. 191-196.

showed that the number of stiff lambs was reduced markedly when liberal quantities of wheat bran were substituted for part of the oats and barley in a ration which also included cull beans and alfalfa hay. The inclusion of liberal quantities of wheat germ meal in the rations of ewes and in the creep feed almost prevented the occurrence of the disease.

**The influence of location and size of sample in predicting whole-fleece clean yields.** E. M. POHLE, L. N. HAZEL, and H. R. KELLER. (U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 104-112, *illus.* 1).—Correlations between clean yield of wool from 20 Rambouillet and 20 Columbia fleeces obtained from half fleeces and from 56 small samples of approximately 35 gm. each before scouring showed that the most accurate sampling locations were on the side and on the shoulder and breech adjacent to the side. The correlations involving the back and belly were noticeably lower than those involving other locations. Samples from the side of the neck and shoulder were highest in clean yield and in the amounts of clean wool per unit of skin area, while those from the back and belly were lowest in these respects. The average regression coefficients of the sample yields on half fleece yields were 0.97 and 1.08 percent for Rambouillet and

Columbia ewes, respectively. The predicting equation was  $X = \frac{Y-a}{b_{y,x}}$ , where  $Y$

is the observed sample yield and  $X$  is the whole fleece yield to be predicted. The individual regressions were lowest on the belly, back, and top of shoulder, and highest on the side. The correct regression coefficient for predicting whole fleece yield from small-sample yield thus depends on the location from which the samples are taken. Correlation of whole fleece yield and yields of 35-gm. samples from the side averaged 0.85 for Rambouillets and 0.87 for Columbias. The regressions of small-sample yields from the side on whole fleece yields averaged 1.05 for Rambouillets and 1.32 for Columbias. The influence of size of sample upon indication of accuracy of yield was studied in three ways—(1) by deriving the theoretical correlations expected between whole fleece yield and samples of varying sizes, (2) by combining the 56 small-sample yields into larger groups and calculating correlations between these and half-fleece yields, and (3) by combining the 12 small-sample yields from the side in several ways and calculating correlations between these and whole-fleece yields.

While the accuracy of sample yield can be increased by taking samples larger than 35 gm., the rate of increase becomes progressively smaller as the size of the sample is increased. The location of the sample is fully as important as the size. Wool technicians stand to gain many advantages by adopting uniform technics, especially if there is commercial application. Agreement on a standard sampling location seems advisable. The middle of the side is suggested for this purpose because it is centrally located within the most accurate region and samples may be taken there conveniently. Standardization of the equation for prediction from sample yields may not be possible. Samples weighing 35 gm. are adequate for a breeding program where the clean yield of many fleeces must be predicted, but samples of 150 to 200 gm. may not provide the accuracy required for rigorous experimental purposes. The number of samples taken from 10 each of Columbia and Rambouillet ewes in 1942 and 1943 served as the basis for the study. The fleeces were split in half and the right half was divided into six major regions, which were subdivided into the following number of samples according to the position on the body: Neck 10, shoulder 8, side 12, back 8, breech 12, and belly 6.

**Comparison of the yields of side samples from weanling and yearling sheep.** C. T. BLUNN and J. O. GRANDSTAFF. (U. S. D. A. et al.). (*Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 122-127).—Data on the clean wool yields of side samples col-

lected at weanling and yearling ages from 461 crossbred ewe lambs raised at the Southwestern Range and Sheep Breeding Laboratory at Fort Wingate, N. Mex., during the 5 yr. 1939-43 were analyzed. More than half of the lambs were either F<sub>1</sub> Corriedale × Navajo or F<sub>1</sub> Romney × Navajo. The average yields at the yearling age were from 6.5 to 22.8 percent lower and much more variable than the weanling yields of the same sheep. About 5 percent of the total variance of the yield at both the weanling and yearling ages was due to the effect of the rams used within years. About 2 percent of the weanling variance and 41 percent of the yearling variance was due to the effects of differences between years. Differences between lambs represented about 93 percent of the total variance in the weanling yields and only 54 percent of the yearly variance. Weanling and yearling yields for individual years and progeny groups varied greatly, ranging from nonsignificant to highly significant correlations. A highly significant correlation of 0.45 was found between yields of weanling and yearling samples independent of the effect of years and rams used. However, the regression equation for these data had little practical value for estimating yearling yields from weanling data because of extreme variations due to environmental conditions. Additional long-time studies are thought to be needed to determine the part played by other fleece characters and environmental factors on the yields.

**Sampling wool clips for clean yield by the core boring method**, A. W. NORDSKOG, R. T. CLARK, and L. VAN HORN. (Mont. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 113-121).—The core-boring method of H. J. Wollner and L. Tanner<sup>2</sup> was used to sample the clean yield of the wool clip of about 2,700 fleeces, employing 264 core samples. The intragrade variance in clean yield of the aged-ewe wool and yearling-ewe wool is 30.0 and 12.0, respectively. The sampling error ( $P = 0.05$ ) of the mean of 29 cores of aged-ewe fleeces was equal to 2 percent, while 115 cores were required for an error no greater than 1 percent. For yearling-ewe fleeces these numbers would be 2 and 46, respectively. There would be required about 17 and 24 percent larger samples of ungraded than graded aged-ewe and yearling-ewe wool, respectively, for the same level of accuracy.

**Monthly changes in fineness, variability, and medullation in hairy lambs**, E. M. POHLE, H. R. KELLER, and L. N. HAZEL. (U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 37-46, illus. 9).—The numbers of hairs in the fleeces of 69 lambs classified as hairy at docking were found to constitute only a small fraction of the total population, and the proportion of hairs decreased very rapidly as the lambs increased in age. Fewer hairs were found on the sides than on the thigh or back. The diameter of the fibers decreased between 6 and 11 mo. of age, with a slight increase thereafter. Weaning, subsequent poor feeding, or inherent properties may have played a part in this situation. The variability of the fiber diameter decreased until about 11 mo. of age. Variability was greatest on the thigh and least on the side. Monthly trends in variability were similar on sides, thigh, and back. Percentage medullation decreased very rapidly from 2 to 5 mo. of age, and more slowly thereafter. Rather pronounced increase was noted in medullation on the thigh during the last 3 mo. Medullation varied considerably from month to month for individual lambs. No important differences were found as regards hairiness in yearling fleeces of hairy and nonhairy lambs. Mean diameter, variability, or percentage medullation were likewise not different on hairy and nonhairy individuals.

**The influence of fish meal and fish oil on the flavor of pork**, C. M. VESTAL, C. L. SHREWSBURY, R. JORDAN, and O. MILLIGAN. (Ind. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 63-67).—Four lots of five hogs each, averaging 67 lb., were fed on dry-lot rations containing 2.5, 10, 10, and 10 percent, respectively, of fish meal which contained 5 percent of oil. Pork chops, loin roasts, and bacon

<sup>2</sup> Indus. and Engin. Chem., Analyt. Ed., 13 (1941), No. 12, pp. 883-887, illus. 5.

from three hogs of each lot were tested for flavor and desirability. The first two rations provided pork without a distinct fishy flavor, but the other two rations, containing 10 percent menhaden fish meal plus 0.5 and 1.5 percent, respectively, of menhaden fish oil, produced pork with considerable fishiness in flavor. Roasts and bacon from hogs fattened on a ration with 1.5 percent fish oil in addition to 10 percent fish meal were decidedly fishy in flavor, and there was some fishiness in the chops. Less fishy flavor was found in the meat from the lot receiving 0.5 percent fish oil than from the lot receiving 1 percent fish oil. Fishiness was more pronounced in the roasts and bacon than in the chops. Some undesirable flavor other than fishiness was found in the roasts and chops of all lots receiving the larger amounts of fish meal. Undesirable flavors were more pronounced in the fat than in the other parts.

**Growth of horses under western range conditions**, W. M. DAWSON, R. W. PHILLIPS, and S. R. SPEELMAN. (U. S. D. A. and Mont. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 1, pp. 47-54, illus. 4).—Growth data are reported up to 3 or 4 yr. on 297 horses foaled from 1927 to 1934, inclusive, comprising 16 Belgians, 59 grade draft horses (ranging from one-half to nearly pure Belgian), 75 Morgans, and 147 grade-light horses. Some of the last were sired by Thoroughbred stallions and others by Morgan stallions, and a few by a grade-Standardbred stallion. The grade-light horse stock was mainly produced by western saddle mares of unknown breeding, but many of the mares obviously carry some improved light-horse blood, and this group also included progeny of Morgan mares and Thoroughbred stallions. The colts grew normally from birth to 18 mo. of age, but they lost weight when principally on range pasture, and although they made rapid gains in the following summer on grass they matured at a somewhat smaller size than expected if they had been full-fed throughout the whole growing period. Significant differences in both growth and height were found between the various breed groups. Males appeared to be larger than females but matured more slowly. Differences in sex increased with age up to 5 yr. Weight was affected more than height by adverse conditions. Yearly variations in growth were significant but not consistent in various groups.

**Some observations on draft mares at foaling time**, K. S. HARMON. (Okla. A. and M. Col.). (*Cornell Vet.*, 35 (1945), No. 1, pp. 62-64).—Observations on the gestation periods and conditions related to parturition of 13 heavy draft mares averaging 1,950 lb. in the draft horse herd of the Oklahoma A. and M. College.

**Approved practices in poultry production**, G. C. COOK (*Danville, Ill.: Interstate*, 1945, pp. 187, illus. 77).—A popular book on production of poultry and turkeys.

**Further studies on the apparent effect of digestibility upon growth, weight-maintenance, and egg production**, G. F. HEUSER, L. C. NORRIS, H. T. PEELER, and M. L. SCOTT. (Cornell Univ.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 142-145).—Rations containing ingredients of a fibrous nature were less efficient for growth, egg production, and maintenance of body weight than feeds of a less fibrous nature, such as whole wheat, corn, and rolled oats. These results were obtained in two experiments with Single-Comb White Leghorn and Rhode Island Red chicks fed to 8 weeks of age in lots of 25 or 30 chicks each. The rations were made with high- and low-fiber content with 2 or 8 percent fish meal in one of the experiments. The added ingredients did not furnish any necessary factor. The greater efficiency of the less fibrous ration appears to be due to a greater amount of digestible nutrients. Growth was always greater when corn replaced wheat bran or ground oats, when crushed wheat replaced wheat bran and middlings, and when crushed wheat and ground rolled oats replaced wheat bran middlings and pulverized oats. The average egg production after about 12 mo. by hens receiving the wheat byproduct rations was 188.2, and by hens fed crushed wheat rations 199.6.

**Protein utilization and supplementary relationship of protein concentrates in basal diets of cereal grains and cereal by-products for growing chickens, A. H. VANLANDINGHAM, T. B. CLARK, and B. H. SCHNEIDER.** (W. Va. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 105-111).—The percentage protein utilization of the protein in corn, wheat, and in combinations of corn and wheat byproducts was ascertained, as well as the supplementary relationships, when meat scrap, menhaden fish meal, and soybean meal were fed with basal rations containing corn and corn gluten or corn and wheat standard middlings or ground whole wheat and wheat standard middlings, using methods employed in previous investigations (E. S. R., 87, p. 837). White Leghorn cockerels from 6 to 12 weeks of age were used in the six experiments with 5 lots of 8 to 11 chicks in each. The chickens were force-fed, and the test proteins provided 87.5 percent of the total nitrogen in the ration and were mixed to contain 16 percent crude protein. With the basal ration of yellow corn and corn gluten, meat scrap had an average value of 73.5, menhaden fish meal 76.0, and soybean meal 89.2 percent. With the basal ration of corn meal and wheat standard middlings, average values of 81.8, 78.7, and 92.4 percent, respectively, were obtained for these protein products. When ground whole wheat and wheat standard middlings where used in the basal ration, the respective values were 77.2, 67.1, and 80.8 percent. The proteins in corn, wheat, and a combination of corn and wheat standard middlings were utilized to about the same extent, varying from 77 to 79.5 percent. The supplementary value of the concentrates varied with the basal ration used. In some cases there was no supplementary relationship as between wheat and menhaden fish meal proteins, whereas in others there was a supplementary value of 19.2 percent in the proteins of corn, wheat standard middlings, and meat scrap.

**Good range and pasturage pays well in growth of chickens, D. C. KENNARD and V. D. CHAMBERLIN** (*Ohio Sta. Bimo. Bul.* 233 (1945), pp. 76-82).—In two experiments White Leghorn pullets made satisfactory growth after the first 7 weeks on free range, pasturage, and whole grain without mash. One experiment with Rhode Island Red pullets indicated definitely the limitations of the range, even with the best pasturage, and the need for the range mash for a large number of pullets confined to a limited range.

**Maturing pullets on grass range with diets of laying mash or grain with oyster shell, C. S. PLATT.** (N. J. Expt. Stas.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 168-170).—To obtain information on whether partly grown pullets could be successfully reared on grass range with grain, laying mash, or laying mash and grain with oystershells, 177 White Leghorn pullets 12 weeks of age were divided into 3 lots. Each lot received oystershells ad libitum. Slightly heavier pullets were obtained with egg production started when grain was fed to the exclusion of laying mash or when the pullets received grain and mash. However, sexual maturity was retarded approximately 54 days, and the amount of feed consumed per bird and per pound of gain was greater than when the grain was supplemented with a laying mash. Pullets receiving only mash did not mature any more rapidly than when grain and mash were provided, and more feed was required per unit of gain. Egg production after sexual maturity was highest in the group reared on grain alone, but total egg production up to 38 weeks was lowest in the group reared on grain only. Egg production by the grain-reared group up to November 30 was heavier than those produced by the other two groups. The amount of range was inadequate for those receiving grain alone. No permanent injury was apparent from the exclusion of either mash or grain from the ration of maturing pullets when range was provided.

**The value of choline additions to a corn and soybean oil meal chick ration containing distillers' dried solubles, J. A. MARVEL, C. W. CARRICK, R. E. ROBERTS,**

and S. M. HAUGE. (Ind. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 181-186).—Continuing the study of the role of choline and methionine in chick nutrition (E. S. R., 91, p. 730), and soybean meal and soybean oils, in a ration with distillers' dried solubles (E. S. R., 92, p. 827), the weights of male chicks at 8 weeks of age showed that the total choline content of the ration was not a safe index of the adequacy or inadequacy of the ration for growth. Rapid growth was obtained when a ration of corn, soybean meal, alfalfa leaf meal, distillers' dried solubles, minerals, and vitamins was supplemented with 0.15 percent choline chloride to give a total choline content of 0.29 percent. Some of the choline in soybean crude lecithin was available to the chick. Additional heating of soybean meal of inferior growth-promoting value failed to improve the growth promotion. Casein or meat and bone scraps substituted on an equal protein basis for soybean meal in an all-vegetable corn and soybean meal chick ration exhibited a choline- or methionine-like action. Although the total choline or methionine content of the ration was not increased, this effect may result from an increased availability of these products or other growth-promoting factors. Supplements of 10 percent meat and bone scrap were no more effective than 5 per cent choline with corn and soybean meal. The experiment was conducted with 19 lots of male and female chicks fed to 8 weeks of age.

The effect of soybean oil meal on the incidence of "pasting up" in baby chicks, L. R. BERG, G. E. BEARSE, and V. L. MILLER. (Wash. and West. Wash. Expt. Stas.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 122-125, illus. 1).—Observations on the amount of pasting up in chicks receiving different proteins were made in four trials. During 2 weeks in the first trial 450 chicks received soybean meal as the sole protein supplement, whereas herring fish meal furnished the protein supplement of another 450 chicks. The chicks were graded 0 to 3 by the amount of fecal material adhering to the down at 1 and 2 weeks. Only 3.1 percent of the chicks receiving fish meal showed any degree of pasting up, whereas 28.7 percent of the chicks on the soybean meal ration were pasted up. The average score of fish-meal chicks was 0.023 and the soybean meal fed chicks 0.29. In the second trial 440 chicks were fed. The average pasting up scores were 0.02 for those receiving fish meal, 0.03 for those receiving casein, and 0.43 for those receiving a soybean meal supplement. The third trial was conducted with rations containing from 18 to 24 percent of protein, in which all the supplemental protein was soybean meal, with comparison of chicks receiving 20 percent protein from fish meal. At 6 weeks of age the average pasting up score of the chicks on fish meal was 0.13, whereas for the 18, 20, 22, and 24 percent protein rations from soybean meal the scores were, respectively, 0.19, 0.42, 0.65, and 0.81. In the fourth trial rations were made up containing 20 per cent protein with soybean meal from five different manufacturers. The pasting up scores made on the sixth day were 0.44, 0.40, 0.62, 0.84, 0.60, and 0.80. Five of those meals were prepared by the expeller process and one by the solvent process, which showed the least pasting up, but the differences were not great. The source of supplemental protein thus influenced the amount of pasting up, as did also the amount of protein in the soybean meal rations. Feeds with soybean meal apparently should not contain over 18 percent of protein.

Abnormal appetite of laying hens in feeding experiments, G. D. BUCKNER, W. M. INSKO, JR., and A. H. HENRY. (Ky. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 120-121, illus. 1).—In metabolism and feeding experiments with laying hens, and probably with animals in general, the individual appetite, hunger, or need for food must be considered. This was shown in the examination of the gizzard contents of 12 of 24 Rhode Island Red yearling hens which were confined in laying houses for 6 weeks and then given access to bluegrass pasture for 2

weeks. The gizzards of 3 of the hens contained no grass, but two of the gizzards contained about 98 percent grass and the contents of the other five gizzards were 25-65 percent grass. These variations are thought to result from an obscure urge to obtain some material which apparently was lacking in the feed of individual hens.

Maintenance requirements of chickens and productive energy of feeds as related to age, G. S. FRAPS (*Texas Sta. Bul.* 665 (1944), pp. 34).—The maintenance requirements of chickens from about 7 to 28 days of age in 70 experiments ranged from 9.4 to 20.5 calories of productive energy per 100 gm., with an average of 13.6. The maintenance requirements of individual chickens fed the same ration varied to a considerable extent not related to weight or sex of the birds. The average maintenance requirement was 12.4 calories of productive energy per day per 100 gm. for rations containing over 31 percent protein, whereas the average maintenance requirement was 15.8 calories per day per 100 gm. for rations averaging 16.2 percent protein. Chickens up to 12 weeks of age had approximately the same maintenance requirement as younger birds. In a summary of these tests chickens 6-18 weeks of age utilized the metabolizable energy of food for production of fat and flesh as efficiently as younger chickens. "Hydrogenated cottonseed oil with an iodine number of 65 had about the same digestibility and productive energy value as cottonseed oil. Hydrogenated oil with an iodine value of 10 had a low digestibility, and the digested portion had about 70 percent of the productive energy of cottonseed oil." Maintenance requirements for older chicks were more suitably calculated on a weight basis than based on surface area. Unusually high or low productive energy values may result from incorrect assumptions of the productive energy value of specific feeds.

Is the size of the genital eminence of the day-old cockerel related to body weight? R. F. BALL. ([N. Y.] Cornell Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 190-191).—A study showed no relation of the size of the genital eminence of day-old Single-Comb White Leghorn cockerels and the mature body weight. More than 200 cockerels in each of 2 groups were classified at hatching.

A comparison of fats in laying pullets and yearling hens, G. D. BUCKNER, W. M. INSKO, JR., and A. H. HENRY. (Ky. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 126-127).—The iodine number and refractive index of neck, abdomen, and subcutaneous fats of Single-Comb White Leghorn pullets and hens were similar in the different parts of the same individuals, but were larger in the older birds than in the pullets. The fat constants were more uniform for pullets than for hens. The fat color was similar at both ages.

Fattening poultry by feeding "female" hormones, R. G. JAAP and R. B. THOMPSON. (Okla. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 51 (1945), No. 3, pp. 108-110).—This article deals largely with the results previously reported (E. S. R., 91, p. 673). About 40 to 50 mg. of dianisylhexene per pound of feed seemed the most suitable in the feed.

The influence of diethylstilbestrol on fat deposition and meat quality in chickens, F. W. LORENZ. (Univ. Calif.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 128-134).—Marked increases in the fat content of the muscle tissue and the depot fat occurred in cockerels treated by implantation subcutaneously of pellets of diethylstilbestrol formed by fusion. The cockerels were autopsied at 2-5 weeks after a single implantation. All had more fat than the controls, but the fattening effect was increased with increased duration of the treatments. These increases were brought about in cockerels varying from 7 weeks to 1 yr. of age at the time of autopsy. The diethylstilbestrol also improved the meat quality of the birds, especially the older individuals which normally are tough and darkened in color of the meat. The effects of the treatment on the depot fat was rapidly reversed by removal of the diethylstilbestrol pellets, although the muscle fat persisted longer. As much as 20 times the subcutaneous dose administered orally failed to

produce fattening. The effects of the treatment on growth were not marked. The extra gains as a result of diethylstilbestrol were in the same order as the amount of extra fat deposited. The birds were subjected in different lots, consisting of 3 to 12 individuals, to variable treatments up to 5 weeks' exposure to the implantations, with data obtained on the weights of the abdominal adipose tissue, muscle fat, and absorption of the diethylstilbestrol pellets.

**Use of androgens to obtain red comb, face, and wattles in estrogen-fattened chickens,** R. G. JAAP and R. H. THAYER. (Okla. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 187-188).—The paleness of the comb, face, and wattles of estrogen-fattened broilers was remedied or prevented by androgen treatment, which was accomplished by incorporating dried cow manure in the feed or by inunction of the comb, face, and wattles with a minute quantity of methyl testosterone in an ointment base. The studies were based on effects on 36 White Plymouth Rock cockerels divided into 3 lots. Dianisylhexene dissolved in oil was thoroughly mixed with the feed to provide 50 mg. of estrogen and 4.5 cc. of oil per pound of mash for the birds in one lot. Those of the second lot were smeared with the same amount of methyl testosterone (0.3 mg.), as used in the treatment of capons in another test. The third lot received a ration of 10 percent of active dried cow manure. The comb, face, and wattles of those receiving the cow manure were bright red in color throughout the 14 days of the experiment. The combs did not increase in length, but they increased 2.5 mm. in height.

**Effect of the thyroid hormone on egg production of White Leghorn hens,** C. W. TURNER, M. R. IRWIN, and E. P. REINEKE. (Mo. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 171-180, illus. 2).—The optimum level of protamone, an iodinated casein (E. S. R., 89, p. 435), when added to a basal ration for egg production was between 5 and 10 gm. per 100 lb. of feed. Lots of 12 2-year-old White Leghorn hens each received 0, 5, 10, and 20 gm. of protamone per 100 lb. of feed. The average egg production for the year was 22.6, 38.1, 40.6, and 30.7 percent. These amounts of protamone were without effect on egg weight, but all lots showed increased production over the controls. The chickens fed protamone lost weight slightly during the first month, but regained it during the second month and continued to gain in body weight during the winter, then declined slightly in the summer. There was no relation between mortality and dosage. Measurements of CO<sub>2</sub> output by guinea pigs receiving eggs from protamone- and nonprotamone-fed hens showed significant differences. Mortality of the hens was high, but it was not related to protamone feeding.

**A comparison of two methods of supplying calcium to laying pullets,** L. R. BERG, G. E. BEARSE, and V. L. MILLER (*Washington Sta. Bul.* 458 (1944), pp. 20).—In 12 lots of 38 Single-Comb White Leghorn pullets each, 2.30, 6.64, 11.00, and 13.12 percent of limestone flour were compared in duplicate as additions to four mashes made up of 60 to about 75 percent of cereal base which included about half wheat mill run with the balance made up of ground corn, ground wheat, ground oats, and ground barley. The lots received varying supplements of limestone grit. Analyses showed the amounts of calcium in the mash and scratch rations to average 0.926, 1.875, 2.727, and 3.080 percent in the different lots. Observations were made during 28-day periods of the egg production, body weights, feed consumption, and shell thickness and smoothness. Equally good results in egg production and eggshell quality were obtained whether the calcium was supplied in the mash or as a supplement. The laying birds consumed limestone grit when made available, even though sufficient calcium was otherwise provided. Shell smoothness was not influenced by the level of calcium in the ration. When laying at an average rate of 50 percent for twelve 28-day periods, White Leghorn pullets did not require more than 1.88 percent calcium in the

iation, and not more than 2.14 percent calcium was needed to produce satisfactory eggshells. Thinner shells were found on the eggs of high-producing birds than on those with less egg production. Decrease in shell thickness during the spring and summer was apparently due to other factors than increased temperature.

**Carbonic anhydrase in the calcification of the egg shell,** M. S. GUTOWSKA and C. A. MITCHELL. (Mass. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 159-167, illus. 4).—The carbonic anhydrase concentration of the shell gland was related to a hen's ability to lay strong, smooth-shelled eggs. The same hens could be induced to lay strong-shelled, soft-shelled, or rough-shelled eggs by inhibiting the activity of the anion-liberating mechanism, carbonic anhydrase, by subcutaneous sulfanilamide injections of 0.16 gm. per kilogram weight of hen. The carbonic anhydrase activity of the blood was 4.5, both in good layers and in nonlayers. There was no significant difference in the carbonic anhydrase content of the blood of good layers and of that of hens laying soft-shelled eggs, whereas the reproductive system showed definite differences. Good layers of strong-shelled eggs showed a carbonic anhydrase activity of 0.52, but hens laying only soft-shelled eggs averaged only 0.14 and nonlayers had an activity of 0.17. As follicles became larger the carbonic anhydrase activity became less, indicating that the yolk has purely passive activity. Sulfanilamide tends to inhibit the carbonic anhydrase, and the quality of eggshell drops. Several hens injected with sulfanilamide showed a decrease in the carbonic anhydrase activity of the shell gland and ovary. The theory proposed is "that carbonic anhydrase acts as a catalyst in the shell gland for the decomposition of carbonic acid, which may be formed from the bicarbonate ions from the blood, thus allowing a greater number of carbonate ions to be produced. These carbonate ions are then utilized in calcium carbonate deposition, calcium being absorbed by the shell gland in its bound form, and dissociating here from the protein."

**Influence of temperature on changes in storage eggs as measured by radio-frequency conductivity,** A. L. ROMANOFF and G. O. HALL. ([N. Y.] Cornell Expt. Sta.). (*Food Res.*, 9 (1944), No. 3, pp. 218-220, illus. 1).—Another account of studies previously noted (E. S. R., 82, p. 380; 86, p. 315).

**The relationship between the water transfer and the pH of egg contents in stored eggs,** C. A. DENTON and H. W. TITUS. (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 135-138, illus. 1).—Eggs held for 12 weeks at 29°-31° F. had the lowest pH values of whites and yolks when stored in 100 percent carbon dioxide under pressure with 4 mm. of mercury above atmospheric pressure, whereas those stored under 10 percent sodium hydroxide had the highest values. Some of the eggshells were covered with partially polymerized methylmethacrylate or with paraffin. There was a linear relationship between the gain in water by the yolks and the pH of the whites when the shells were not covered. In the experiments in which the shells of the eggs were covered, there was no consistent correlation between the pH of yolks and their gain in weight. The study was conducted with 72 eggs divided into three equal lots. The whites and yolks of the fresh egg controls were analyzed and the pH ascertained by measurements on the whites and yolks with an electronic pH meter, as ascertained according to methods previously described (E. S. R., 90, p. 518).

**Facts about vitamins for chickens,** L. C. NORRIS. (Cornell Univ.). (*Poultry Tribune*, 51 (1945), No. 2, p. 16).—A chart giving the names, function, chief sources, and quantity of vitamins required for growth and egg production.

**Effect of ascorbic acid injections on the amount in the blood plasma of laying hens,** G. H. SATTERFIELD, T. A. BELL, F. W. COOK, and A. D. HOLMES. (Mass. Expt. Sta. et al.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 139-141, illus. 1).—The ascorbic acid content of the blood of laying hens was increased from an average

of about 1.6 mg. per 100 cc. of blood plasma to 5.7 mg. in about 25 min. after the injection subcutaneously of 50 mg. of ascorbic acid. Within 2 hr. after the injection the amount of ascorbic acid in the blood had returned to normal. There was no detectable difference in the physical appearance, vitality, or egg production of the birds as compared with the controls. A group of 12 Rhode Island Red hens were used in the study, with one-half of them receiving two subcutaneous injections of 50 mg. of ascorbic acid per week for 9 weeks, and with four injections per week for the balance of the experiment.

**A-hypovitaminosis in commercial poultry flocks on basis of nasal histopathology**, E. JUNGHEERR, ([Conn.] Storrs Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 112-119, illus. 4).—The method of diagnosing A-hypovitaminosis in birds by nasal histopathology (E. S. R., 91, p. 198) was found applicable to turkeys and pheasants as well as to chicks. Of 252 lots of chickens comprising 354 birds, 47 lots or 60 birds showed positive lesions. Grossly 5 of the 47 lots had small whitish flakes in the conjunctival sac which were suggestive of vitamin A deficiency. Microscopic lesions consisted of true squamous metaplasia of the nasal mucosae and varied greatly in severity. A single lesion was considered doubtful and nondiagnostic. There were 14 birds with doubtful lesions. In 21 positive lots containing 2 or more birds each, both birds of about half of the lots severely affected were positive. In some cases well-developed lesions were found in chicks 2 to 14 days old, suggesting egg-borne deficiency. There was no correlation of A-hypovitaminosis with breed, sex, or season, even though the survey extended through the summer of 1943, which was marked by a scarcity of yellow corn and of rain. Likewise, there was no relation of the findings to diagnosis, including respiratory diseases, visceral gout, and various types of management. A significantly higher incidence of A-hypovitaminosis was found in the age groups of 5 to 16 weeks than in the fowls of other ages, supporting the greater requirement of the growing chicks for vitamin A than the requirement of the older birds. Differences were demonstrated in 38 known brands of feed, indicating this method for differentiating feeds in their vitamin A content. Various parasitic and constitutional diseases may play a part in the condition.

**Some observations on fertility in turkeys**, T. T. MILBY and R. B. THOMPSON (*Poultry Sci.*, 24 (1945), No. 2, pp. 99-104).—Observations were made on the fertility of turkey eggs of the White Holland, Bronze, Broad-Breasted Bronze, Bourbon Red, Black, Narragansett, Slate, and Small-type White varieties in the first, second, and third hatches from 1938 to 1943 in Oklahoma flocks. Contrary to the previous contention, records of the Oklahoma Experiment Station do not indicate that toms need to be lighted earlier than hens. This was true for turkeys hatched in February, March, and April. Short duration of cold waves did not affect fertility, but a cold wave of 10 days' duration caused a marked decline in fertility in all varieties. Preferential mating and sterility of some toms and hens resulted in variable fertility in different years, even where toms were rotated. Preferential mating was responsible for a great deal of low fertility in certain matings. Artificial lights were on in some pens from 5 a. m. to daylight. Others were lighted all night, whereas some received no artificial light.

## DAIRY FARMING—DAIRYING

**Hay-crop silage: A summary of ten years' work**, C. C. HAYDEN, A. E. PERKINS, C. F. MONROE, W. E. KRAUSS, R. G. WASHBURN, and C. E. KNOOP (*Ohio Sta. Bul.* 656 (1945), pp. 25+, illus. 6).—The making of silage from legumes and other hay crops over a 10-yr. period was compared in two experiments in which 4 parts of 2 N hydrochloric acid and 1 part of 2 N sulfuric acid were mixed and

applied by running into the blower of the silage cutter with alfalfa-clover, making A. I. V. silage in two 25-ton silos. Silage made in this manner was fed to four groups of cows, starting 104 and 181 days after filling the silos. Groups of cows received the silage and other groups hay as the only roughage for 115 days in each case, together with 4 oz. of finely ground limestone daily per head with the silage and 2 oz. per day with the hay. The feeding of the silage to the cows caused a marked decrease in the pH and bicarbonates and a marked increase in the ammonia nitrogen in the urine. The CO<sub>2</sub> capacity of the blood was decreased slightly, with the calcium remaining normal. There was no marked effect on the cows or the quality of the milk resulting from feeding A. I. V. silage during the winter in contrast with hay, but about 13 percent more in dry matter was consumed in the silage ration and more milk was produced. Using the double reversal method in two 46-day feeding periods, the cows produced 5.5 percent more milk on the silage and gained 131 lb. more weight than on the hay ration. It appeared that some growth-stimulating factor was transferred from the silage to the milk, as observed in trials with rats. Sulfuric and hydrochloric acids were expensive, injured the machinery, and are not recommended for practice.

In nine lots, hay crop silage was treated with 10-30 lb. of phosphoric acid per ton. The pH of this silage averaged 4.5, and in no case was it below 4. Phosphoric acid gave no higher preservation of the carotene than was found in untreated silages, and weight was lost by dairy cattle on the phosphoric acid silages as compared with corn silage. The ammonia in the urine of cows fed phosphoric acid silage was increased, and the pH and bicarbonates were decreased. It is concluded that the phosphoric-acid-treated silage should not be fed too liberally.

In other tests, 15 lots of hay crop silage were treated with molasses in amounts of 33-100 lb. per ton of green crop, but the results were only slightly better than those obtained with untreated silages. In only one lot was the pH of molasses silage reduced below 4.0. In other tests legume silage treated with dry ice was similar to untreated silage made with these legumes. Alfalfa and carrots and alfalfa and green wheat made good silages. The dry matter content of untreated silage should be kept between 25 and 40 percent, as indicated from results with 23 lots of untreated silage, the importance of the dry matter content being clearly brought out in studies on 69 lots of hay crop silage. A note was previously made of some of this work (E. S. R., 77, p. 91).

**Seepage losses from a silo,** J. G. ARCHIBALD and C. I. GUINNESS. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 321-324, illus. 2).—Study of seepage from a 100-ton silo over a 7-yr. period led to the conclusion that with good management seepage losses may be insignificant. The average loss of dry matter in the seepage for 7 yr. was 0.54 percent, with the minimum loss, in 1944, 0.12 percent and the maximum loss, in 1942, 1.08 percent. Loss from molds and rots makes loss from seepage comparatively very small. The silage was made from mixed grasses and legumes, with grasses predominating.

**The use of wheat in dairy grain mixtures** (*Ohio Sta. Spec. Cir.* 70 (1944), pp. 8, illus. 2).—Grain mixtures consisting of 33½ to 100 percent wheat were successfully fed to cows as similar mixtures containing corn. The wheat may be fed up to 50 percent of the mixtures, or even larger amounts for short periods, with success, but as a general rule extremes should be avoided because of a possible lack of vitamin A in the milk produced. The need of feeding high-quality hay was increased as the percentage of wheat in the grain mixture increased, particularly to insure an adequate intake of vitamin A. Since finely ground wheat may become pasty, wheat should be coarsely ground. It may be safely fed in reasonable quantities, but moldy or musty wheat should be fed with caution or may be unfit for feeding. Tests should be conducted with such feeds on less valuable

animals. Satisfactory roughages should be included, especially when consideration is given to the carotene content of the resulting butter and cheese. Varying numbers of cows per lot were used in tests with the wheat mixtures. In all, six experiments were conducted for varying periods extending as long as 7 mo.

**Relation of nutrition to growth and breeding performance in dairy bulls.—I, Alfalfa hay rations, I. R. JONES, R. W. DOUGHERTY, and J. R. HAAG.** (Oreg. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 311-320, illus. 1).—Continuing studies of feeding alfalfa hay alone (E. S. R., 73, p. 227), two Jersey and two Holstein bulls grew at 10-15 percent below normal on a ration after 5-7 mo. of age of alfalfa hay containing 14-15 percent crude protein, disodium phosphate, salt, and potassium iodide solution. Semen samples showed more desirable characteristics after 18 mo. of age than before. All bulls proved fertile in breeding tests at 24-40 mo. of age. Another group of one calf each of both breeds received the same ration supplemented with a small amount of high-quality concentrates. All the calves received whole milk or skim milk with added fat and vitamin A until about 30 days of age, followed by skim milk for various periods. The total weights and height measurements were recorded to 2 yr. of age, and semen examinations were made, with information obtained on the sperm motility. The two bulls receiving additional concentrates grew normally. The weights and height of the bulls and the preceding calves were recorded and compared with growth standards.

**Cobalt deficiency in cattle in the north eastern region of Wisconsin, R. P. GEVER, I. W. RUPEL, and E. B. HART.** (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 291-296, illus. 2).—The normal hemoglobin content of cattle blood was 9.5-12.5 gm. per 100 cc. for cattle above 7 mo. of age, but a deficiency of Co characterized by unthriftiness and anemia was observed in cattle of northeastern Wisconsin, as noted by Baltzer et al. (E. S. R., 86, p. 91) for Michigan cattle, and Co therapy as recommended by them was employed. The Co deficiency was corrected by feeding 1 oz. of  $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$  per 100 lb. Good results were also obtained by daily feeding of 1 teaspoonful of a solution made by dissolving 1 oz. of either the sulfate or the chloride of Co in 1 gal. of water. The species showed a high tolerance for Co excesses. As much as 50 mg. per day produced no polycythemia.

**Further studies of the influence of different levels of fat intake upon milk secretion, IV, J. K. LOOSLI, L. A. MAYNARD, and H. L. LUCAS** ([*New York Cornell Sta. Mem.* 265 (1944), pp. 32, illus. 2].—Continuing studies of the influence of the fat content of the grain mixture on the production of fat-corrected milk (E. S. R., 86, p. 82), the influence of factors other than fat on milk secretion were investigated. Four lactation experiments were reported with dairy cows, in which studies were made of the effects on lactation of different intakes of dietary fats, the level of hay intake, the presence of cornstarch in the grain mixture, and methods of calculating the grain allowance. These variables served to test whether certain experimental procedures in previous studies tended to favor the high-fat rations or to limit the application of the results to these practices. A total of 80 cows were involved in experiments of both factorially designed change-over and continuous types. The concentrate mixtures varied from 2 to 53 percent fat.

In two continuous experiments only slightly more milk was produced with a 4 percent fat concentrate mixture than with a 2 percent fat mixture. Results of two change-over types of experiments suggested that the presence of cornstarch in the low-fat grain mixture may temporarily depress milk yield and therefore magnify the advantage for the high-fat mixture. The results also suggest that adjusting the grain allowance weekly according to milk production may unduly penalize the cows fed the low-fat concentrate, as milk yield may drop temporarily when the ration is changed and, further, that feeding hay at the rate of 1 lb. per

day per 100 lb. of body weight may result in a greater difference in milk production between high-fat and low-fat grain mixtures than when more hay, and therefore less grain, is fed. It is further suggested that these factors may have magnified the advantage for fat and its importance since significantly more milk was produced on concentrate mixtures containing 5.3 percent of fat than on mixtures with about 2 percent of fat, irrespective of the presence or absence of starch, the level of hay feeding, or the method of calculating the grain allowance.

"The results of these experiments agree with earlier evidence from this station in showing that fat in a ration for dairy cows is worth more than its calculated total-digestible-nutrient value. Because of the additional fact that fat furnishes more energy value per pound than does carbohydrate, dairymen are justified in giving preference to a mixture of higher fat content. To say what the preferred minimum level of fat should be or how much more the dairyman can afford to pay for a feed of higher fat content involves too many variables to permit of any specific answer for general application. Such fine distinctions are not justifiable for fat any more than for protein. Clearly, supply and demand and price relationships will be the dominant factors in answering these questions. The dairy cow cannot compete with industrial uses or with man for fat. These various considerations are discussed in this bulletin."

The influence of thyroprotein on milk and milk fat production, R. P. REECE. (N. J. Expt. Sta.). (*Holstein-Friesian World*, 42 (1945). No. 8, pp. 17-18, 116).—Increases in the milk production varying from 6 to 19 percent were produced in several cows by feeding thyroprotein for 3-8 mo.

Monthly variations in the composition of milk, O. R. OVERMAN. (Univ. Ill.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 305-309).—In a further study of the monthly variations in the composition of the milk of several breeds (E. S. R., 82, p. 241), analyses are reported on monthly variations of 2,426 samples of milk of Ayrshire, Brown Swiss, Guernsey, Jersey, Holstein, and Guernsey  $\times$  Holstein dairy cattle. It is considered that the samples are representative of the milk of each breed and, likewise, that the mixed milk is representative of that of large numbers of cows of all breeds.

The attraction between the fat globules and the leucocytes of milk, I. I. PETERS and G. M. TROUT. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 277-281, illus. 3).—Washed leucocytes secured by repeated washings of fresh separator slime in physiological salt solution, centrifuging, and decanting were added to pint bottles of pasteurized milk. The bottles were shaken 25 times and stored at 40° F., after which they were observed and photographed by additions of Sudan III. A relatively strong attraction exists between the fat globules and leucocytes in the milk. Thus the depth of the cream layer was increased to the breaking point beyond which a cream layer composed of fat and leucocytes formed at the bottom of the bottle. A mutual attraction between the fat globules and leucocytes seemed to exist, and the amount of leucocytes determined the cream layer. No lower cream layer was observed with additions up to 12.5 gm. of washed leucocytes per pint of milk. When this was added the upper third contained 95.8 percent of the leucocytes present in the milk, which was associated with 92.8 percent of the fat present. This attraction may serve, at least in part, to explain the heavy cream layer of mastitis milk.

The influence of pH on the attraction between the fat globules and leucocytes of milk, I. I. PETERS and G. M. TROUT. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 283-289, illus. 3).—Lowering the pH from 6.5 to 1.5 of a washed-cream, heat-treated whey mixture containing added washed leucocytes as in the above investigation resulted in marked differences between the fat and leucocyte attraction. The closest relationship between them was found at pH 4.3, the

isoelectric point of the fat globules. The attraction between fat globules and leucocytes was not so great below this value as when the pH was above the isoelectric point. Thus the leucocytes did not respond as readily to the sweeping action of the fat when the electric charge of the fat globules was reversed from negative to positive. The results indicate that the attraction of the leucocytes and fat globules is at least based in part on the opposite electric charges carried by them. The methods employed in this study were, first, to heat pasteurized milk held for 24 hr. at 40° to 80° F. and separate; then to dilute the cream with physiological salt solution at 80° and repeat the washing and separation until the salt solution was fairly clear. The mixture was acidified with N/1 HCl down to pH 1.5 and ranged from 6.5 to 1.5.

**The effect of thyroidectomized goat's milk on the heat production of normal and hyperthyroid rats,** J. W. HIEBS, T. S. SUTTON, and W. E. KRAUSS. (Ohio Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 297-304).—Milk from thyroidectomized goats had an inhibitory action on heat production in both normal rats and rats with experimental hyperthyroidism. This effect is attributed to the presence of an antithyroxin in the milk of the thyroidectomized goats. More work seems needed on the use of milk from thyroidectomized goats for the treatment of goiter in humans.

**The influence of breed, feed, and processing on the riboflavin content of milk,** D. R. THEOPHILUS and O. E. STAMBERG. (Idaho Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 259-268, illus. 1).—Milk from Jersey cows was, on an average, 52 percent higher in riboflavin than milk from Holstein cows over a 10-mo. period. The milk from Holsteins ranged from 0.88 to 2.23 mg. and averaged 1.44 mg. of riboflavin per liter, and that from Jerseys ranged from 1.38 to 3.56 mg. and averaged 2.18 mg. per liter. Supporting the findings of Johnson et al. (E. S. R., 85, p. 100), there was an inverse relationship between the milk yield and the riboflavin content of the milk. These results were based on studies of milk from two Jersey and two Holstein cows over a 3-day period. The Holstein cows produced an average of 28.2 mg. of riboflavin per day, whereas the average for Jersey cows was 21.0 mg. A material increase in the riboflavin content of the milk was produced in about 2 days of supplementing a dry ration of concentrates, alfalfa hay, and dried beet pulp with sunflower silage. The morning, noon, and night milk showed a similar riboflavin concentration for the same cows. There was no discernible influence on the riboflavin content as a result of differences in the stage of lactation, season, pregnancy, and estrus. Riboflavin concentration of colostrum was about three times that of normal milk, but about 30 percent of this increase was lost 24 hr. after parturition. The riboflavin content of the milk was not influenced by pasteurization, homogenization, or storage for 24 hr. at 40° F. in a dark refrigerator.

**Vitamin A content of sheep's colostrum and milk,** G. H. SATTERFIELD, R. E. CLEGG, and A. D. HOLMES. (Mass. Expt. Sta. et al.). (*Food Res.*, 9 (1944), No. 3, pp. 206-211).—Samples of colostrum and milk from Hampshire ewes up to 22 days of lactation were assayed by the colorimetric method for determination of the presence of vitamin A. The ewes were maintained during the summer and fall preceding the study on an excellent pasture of lespedeza and native grasses. In December and January the ewes received soybean hay or soybean hay and soybeans. When the lambs were born in February and early March, the ewes received a mixture of corn, oats, wheat bran, and cottonseed meal. The average vitamin A content of the colostrum and milk obtained from ewes that produced lambs that grew to maturity was 10.11, 6.88, 3.98, 3.37, 2.70, 1.03, and 1.10 Lovibond units per gram, respectively, for the first 7 days of lactation. The vitamin A content of the colostrum and early milk was slightly higher from the 2-year-old ewes than from the older ewes.

The vitamin A value of butter, W. J. PETERSON, W. M. ROBERTS, C. D. GRINNELL, and W. L. CLEVENGER (*Res. and Farming [North Carolina Sta.]*), 3 (1945), *Prog. Rpt.* 2, p. 7).—Study of the carotene and vitamin A content of the butterfat of several breeds of dairy cattle showed the Guernsey butterfat had the highest carotene content, with Jerseys, Ayrshires, and Holsteins next. However, Jersey butters usually had slightly lower amounts of vitamin A than the values for Ayrshires and Holsteins.

Bacteriophages for *Streptococcus cremoris* phage development at various temperatures, G. J. E. HUNTER (*Jour. Dairy Res. [London]*, 13 (1943), No. 2, pp. 136-145, illus. 6).—The phage races affecting several strains of *S. cremoris* showed a wider diversity of reaction to temperature conditions than the homologous organisms. They frequently have different optimum growth temperatures. Some fail to multiply at 37° C. It is apparent that these differences may have application in cheese manufacture. The studies were conducted by varying the acid development from 0.15 to 0.60 percent for periods up to 8 hr. at 22°, 30°, and 37°.

## VETERINARY MEDICINE

Chemical warfare and farm animals, W. P. BLOUNT (*Vet. Jour.*, 100 (1944), No. 12, pp. 249-257).—A portion of a lecture dealing with gas warfare and the hazard of phosphorus poisoning.

Some plants poisonous to livestock in Oklahoma, H. I. FEATHERLY (*Oklahoma Sta. Cir.* 118 (1945), pp. 16, illus. 11).—This circular was prepared to meet the demand of county agents, livestock men, and farmers for aid in identifying the more important livestock-poisoning plants of Oklahoma. Twelve plants are briefly described, and in most cases the description is accompanied by a line drawing which shows the important identification marks of the plant. Kinds of animals affected, symptoms, remedies, and prevention are also noted.

[Miscellaneous contributions] (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 2, pp. 103-105, 125-126, 172-175, illus. 1).—These contributions include Temperature Reactions in Dogs to Inoculation With Ferret Passage Distemper Virus, by R. G. Green (Univ. Minn.), a continuation of earlier work (E. S. R., 82, p. 677); Malarial Infections in the Duck Embryo, by L. A. Stauber and H. B. van Dyke; and Occurrence of Hyaluronidase and Lecithinase in Relation to Virulence in *Clostridium welchii*, by E. H. Kass, H. C. Lichstein, and B. A. Waisbren (Univ. Wis.).

Primer Congreso de Médicos Veterinarios de la Provincia de Buenos Aires, 27, 28, y 29 de Mayo de 1943 [First Congress of Veterinarians of the Province of Buenos Aires, May 27-29, 1943] (*La Plata, Argentina: Primer Cong. Méd. Vet. Prov. Buenos Aires, May 27-29, 1943*, pp. 660+, illus. over 100).—This account of the proceedings of the congress includes the papers presented, among which may be mentioned the following translated titles as of research interest: Prophylaxis of Bovine Tuberculosis, by A. D. Castagnet and C. M. Pozzi (pp. 145-155); Apparatus for Artificial Insemination, by E. Garcia Mata and A. E. Cano (pp. 261-276); Centralization of Slaughterhouses, by F. A. Languasco (pp. 337-341); "Mancha" and Gaseous Gangrene in Calves (pp. 343-348), and Dry Sickness or Drought Sickness in Cattle—an Enzootic Characterized by Acute Dyspepsia and Constipation (pp. 349-354), both by E. A. Lerena; Ergotism—a Rare Malady, by J. A. Puissegur (pp. 449-454); Experiences With Phenothiazine (Cattle and Sheep), by J. Maria Quevedo, A. E. Cano, and E. Garcia Mata (pp. 455-471); and Clinical Observations on the Action of *Bacillus coli* in the Horse, by E. P. Durrieu (pp. 655-660).

Meddelanden från Veterinärhögskolan i Stockholm, årgång 16, 1942 (Collected papers from the Veterinary Institute, Stockholm, year 1942) (*Stockholm:*

*Vet. Högsk. Meddel.*, 1942, [about 400 pp., 80 illus.].—This collection of separates from various sources brings together 22 papers as follows: Dosering av sulfonamidpreparat hos större husdjur (The Dosage of Sulphonamid Preparations for Large-Sized Domestic Animals) pp. 105–117+, Eng. abs. pp. 116–117), and Sulfonamidterapi hos husdjur (Sulphonamid Therapy Applied to Domestic Animals) (pp. 619–630+, Eng. abs. p. 630), both by I. Alström; Försök att genom en avbränning oskadliggöra på ytan av bröst- och bukväggarna efter revning förekommande tuberkelbaciller [Attempt at Rendering Innocuous by Searing the Tubercle Bacilli on the Brisket and Abdominal Walls], by O. Brandt and G. Hulphers (pp. 375–381, Eng. abs. pp. 380–381); Något om kolhydratsättningens betydelse för de växttande djurens hälsotillstånd och produktionsförmåga [The Importance of Carbohydrate Metabolism to the Health and Productivity of Herbivorous Animals] (pp. 17+, Eng. abs. pp. 16–17), and Om valpsjuka hos mink [Distemper of Mink] (pp. 610–618+, Eng. abs. pp. 617–618), both by B. Carlström; Klinische Beobachtungen bei der Behandlung rheumatischer Krankheitszustände mit Muskeladenylsäure und Adenylpyrophosphorsäure [Clinical Observations on the Treatment of Rheumatic Disorders with Muscle Adenyl Acid and Adenylpyrophosphoric Acid], by B. Carlström and O. Lövgren (pp. 230–254+); Undersökningar av temperatur, luftfuktighet och katavärden i ladugårdar [Studies of Temperature and Humidity in Cow Barns], by K. Eriksson and B. K. Nordberg (pp. 460–490, Ger. abs. pp. 489–490); Behandling med kolikultur per os vid tvenne fall av kroniskt förlöpande eksem hos häst (Treatment with *coli* Culture, per os, of Two Cases of Chronic Eczema in a Horse), by Hedström and I. Alström (pp. 18–23+, Eng. abs. pp. 22–23); Om transfusion av konserverat blod på hund [Transfusion to Conserve the Blood of a Dog], by A. Holmstedt (pp. 552–565, Ger. abs. pp. 563–564); Bidrag till kännedomen om nekrosbacillens morfologi, biologi och patogenes [Morphology, Biology, and Pathogenesis of the Necrosis Bacillus], by G. Hulphers and T. Henricson (pp. 566–576, Eng. abs. pp. 574–575); Skorbut als Sekundärerscheinung bei A-Avitaminose (Scurvy as a Secondary Phenomenon in A-Avitaminosis), by G. Jonsson, A-L. Obel, and K. Sjöberg (pp. 300–320, Fr., Eng. abs. p. 320); B<sub>1</sub>-vitaminbehov och acetonkroppsbildning vid äggviterik utfodring av råttor [The Vitamin B<sub>1</sub> Requirement and the Acetone-Body Formation of Protein-Rich Foods for White Rats], by G. Jonsson and K. Sjöberg (pp. 41–55, Ger. abs. pp. 54–55); Infektiösa lidanden i sädesblåsorna hos tjur som orsak till sterilitet (Infectious Disorders in the Seminal Vesicles of Bulls as a Cause of Sterility), by N. Lagerlöf, H. Hedström, and S. Hofflund (pp. 602–630, Eng. abs. p. 617); Listerellos hos tjäder [Listerellosis in the Wood Grouse], by K. Lilleengen (pp. 39, Eng., Ger. abs. pp. 33–38); Fysiologiska synpunkter på det habituella atrioventrikulärblocket hos häst (Physiological Views of Habitual Atrioventricular Block in the Horse) (pp. 200–209+, Ger., Eng. abs. pp. 207–208), and Studier av hästens normala elektrokardiogram med särskild hänsyn till förändringar i ventrikellkomplexet efter arbete [Studies of the Normal Electrocardiogram of the Horse, With Special Attention to Alterations in the Ventricle Complex After Work] (pp. 324–357+, Ger., Eng. abs. pp. 350–356), both by N. Obel; Hepatogena och epiphreniska abscesser med inbrott i v. *cava caudalis* hos nötkreatur (Hepatogenous and Epiphrenic Abscesses, With Invasion of V. *cava caudalis* in Cattle), by S. Rubarth (pp. 78–104+, Ger. Eng. abs. pp. 99–102); Kalcium- och fosforomsättningen hos hundvalpar [The Calcium and Phosphorus Metabolism of Young Dogs], by K. Sjöberg (pp. 137–158+, Ger. abs. pp. 155–157); Titration på saltsyra i magsaft från hund [Titration of Free Hydrochloric Acid in the Stomach of the Dog], by K. Sjöberg and M. Jersin (pp. 702–712); Undersökning över eventuell A-vitaminbrist hos kalvar [An Eventual A-Vitamin Deficiency in the Calf], by K. Sjöberg and H. Sandstedt

(pp. 713-733, Ger. abs. p. 732); Über eine Depressorsubstanz, die sich im Serum in vitro bildet [A Depressor Substance Formed in the Serum in Vitro], by K. Sjöberg and E. Åkerblom (pp. 317-322+); and PG-beslaget och dess användbarhet [PG-Fixtures and Their Use], by E. Åkerblom (pp. 734-746, Ger. abs. pp. 745-746).

[Miscellaneous articles on veterinary problems] (*Deut. Tierärztl. Wchnschr.*, 52 (1943), No. 1, pp. 1-10, 11, 13-16).—These articles include the following translated titles: Treatment of Actinomycosis in Cattle—II, The Curative Effects of Mercury, by R. Götsche (pp. 1-4); The Cause and Prevention of the So-called Heart Stoppage of Swine, by Rudau (pp. 5-6); Pervitin as a Warning Sign in Chloralized Horses, by A. Barke and G. Merzdorf (pp. 7-9); To What Extent Can Transmissible Epizootics From Wild Animals, Especially Rabies From Foxes and Badgers, Be Combated by Measures Taken Under the Cattle Disease Laws? by Müssemeier (pp. 9-10); Salt Poisoning in Birds, by Rindfleisch-Seyfarth (p. 11); and New Theories on Fever and Fever Treatment, by Guenther (pp. 13-16).

[Miscellaneous papers from India] (*Indian Vet. Jour.*, 21 (1944), No. 2, pp. 69-76, 98-101, 102-103, illus. 1).—These papers include Some Notes on the Staining Methods of Corpora-Negri in Rabies, by H. C. and P. C. Gangulee; An Advanced Case of Johnne's Disease in a Bellary Ewe at the Livestock Research Station, Hosur, by S. V. Mudaliar; and Alum in the Treatment of Bovine Piroplasmosis, by M. H. Rahman.

[Miscellaneous contributions from Onderstepoort] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 20 (1944), No. 1, pp. 57-83, 97-118, illus. 11).—Among the articles in this issue are the following: A Case of Swine Erysipelas in the Union of South Africa, by D. A. Haig and T. F. Adelaar (pp. 57-59); Dicrotaline—The Toxic Alkaloid From *Crotalaria dura* (Wood and Evans) and *Crotalaria globifera* (E. Mey) (pp. 61-65), and Monofluoroacetic Acid—The Toxic Principle of "Gifblaar" *Dichapetalum cymosum* (Hook) (Engl. (pp. 67-73), both by J. S. C. Marais; Recent Investigations Into the Toxicity of Plants, etc., in the Union of South Africa, by S. J. van der Walt (pp. 75-83); and The Cytology of the Contagious (Venereal) Tumour of the Dog, by C. Jackson (pp. 97-118).

Importância das bactérias anaeróbias em patologia veterinária, partes I-IX [Importance of the anaerobic bacteria in veterinary pathology, I-IX] (*Biológico*, 10 (1944), Nos. 4, pp. 95-102, illus. 4; 5, pp. 129-134, illus. 1; 6, pp. 157-164, illus. 1; 7, pp. 191-198, illus. 1; 8, pp. 227-238, illus. 5; 9, pp. 271-277, illus. 1; 10, pp. 321-328, illus. 8; 11, pp. 367-373, illus. 4; 12, pp. 393-398, illus. 2).—Parts 1, 3, 5, 7, and 9 of this series are by C. A. Rodrigues and V. O. Guida; parts 2, 4, 6, and 8 by Guida and Rodrigues. Part 1 is an introduction to bacteriology; part 2 deals with lameness, part 3 with diseases of sheep caused by *Clostridium welchii*, part 4 with gas gangrene, part 5 with diseases caused by bacteria of the *C. novyi* group, part 6 with diseases caused by *C. septicum*, part 7 with diseases caused by *Fusiformis* spp., part 8 with tetanus, and part 9 with botulism.

A note on the absence of hemagglutinins in certain viruses, L. M. HEATH (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 3, pp. 82-83).—Under the method employed there was no evidence of hemagglutinins in the viruses of ferret distemper, equine encephalomyelitis (western) or lymphocytic choriomeningitis for the washed red blood cells of a horse, a cow, a sheep, a ferret, a rabbit, a guinea pig, or a cockerel. Likewise there were no agglutinins in the virus of hog cholera for the red blood cells of a cockerel. Pooled fresh sera from healthy hogs were hemolytic for the red cells of a cockerel. This property could be destroyed by inactivation or by aging in the refrigerator.

An alkaline medium and procedure for the selection of dermatophytes in the presence of saprophytic fungi, J. M. LEISE and L. H. JAMES. (Univ. Md.). (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 2, pp. 119-131, illus. 3).—Mixed suspensions of saprophytes and dermatophytes plated on the medium described produced ample growth of the latter to permit isolations. Incubation of the poured plates at 34° C. proved most effective. A possible relationship between pH tolerance and pathogenicity is emphasized. The value of the procedure in isolating the causative agents of skin infections and in purifying contaminated cultures of dermatophytes is suggested. "Sabouraud's maltose agar of the following composition was used throughout this study: Bacto-peptone 10 gm., bacto-maltose 40 gm., bacto-agar 15 gm., and water 1,000 cc. No adjustment of the pH was made prior to sterilization at 15 pounds' steam pressure for 20 min." Adjustment was made later to pH 10.5 by use of LaMotte purple.

Sulfamethazine: In vitro action on enteric pathogens as compared with sulfadiazine and sulfamerazine, F. B. SCHWEINBURG and I. J. YETWIN (*Jour. Bact.*, 49 (1945), No. 2, pp. 193-197).—In vitro tests indicated that sulfamethazine "is by far a more effective bactericidal and bacteriostatic agent than the other sulfonamides examined against *Escherichia coli*, *Escherichia coli*, and the *Salmonella* varieties."

Pulmonary alveolar adenomatosis in man. Is this the same disease as jaagsiekte in sheep? D. A. WOOD and P. H. PIERSON (*Amer. Rev. Tuberc.*, 51 (1945), No. 3, pp. 205-224, illus. 11; *Span. abs.*, pp. 222-223).—This contribution deals mainly with a human case report, but considerable attention is given to the morphological similarity between the human lesions and those in sheep associated with jaagsiekte, epizootic adenomatosis, verminous pneumonia, and progressive pneumonia or lung disease in Montana. The infectious nature of jaagsiekte is discussed and the possible virus nature of the two diseases considered. See also a note by Dungal et al. (E. S. R., 80, p. 107).

Susceptibility of hamsters to *Clostridium chauvei*, J. F. RYFF and A. M. LEE. (Univ. Wyo.). (*Science*, 101 (1945), No. 2623, pp. 361-362).—Although in experimental work with *C. chauvei* where clinical infection is necessary, guinea pigs are usually employed, hamsters were found to be more susceptible, succumbing to one-fifth the lethal dose required for guinea pigs on an animal unit basis.

Recovery of equine encephalomyelitis virus (western type) from chicken mites, S. E. SULKIN (*Science*, 101 (1945), No. 2624, pp. 381-383, illus. 1).—According to this preliminary report, "the western type of equine encephalomyelitis virus has been isolated from chicken mites (*Dermanyssus gallinace*) in nature during an outbreak of the equine disease in the Southwest."

El efecto "in vitro" de la tiourea y otros compuestos químicos sobre el virus encefalomielítico tipo Venezuela [The effect in vitro of thiourea and other chemical compounds on the Venezuelan type of encephalomyelitis], F. GALLA (Caracas, Venezuela: *Lit. y Tip. Vargas*, 1945, pp. 49+; *Eng. abs.*, pp. 45-49).—The in vitro effect on the equine encephalomyelitis virus of urea, thiourea, propylene glycol, glycolic acid, thioglycolic acid, the methyl ester of the thioglycolic acid, and urotropine has been investigated.

Thiourea, in a concentration of 9 percent, was found to inactivate the encephalomyelitis virus both in saline and in broth serum, but only when added to the dilutions of the virus already made. The union of thiourea and virus was stable, and the thiourea was found to destroy the antigenic properties of the virus completely. Urotropine, both in vitro and in vivo, and turpentine in vivo failed to show, in the dilutions experimented with, any inactivating or therapeutic effect on the virus of encephalomyelitis. The presence of sulfur in some chemical compounds seemed to enhance their inactivating power over the encephalomyelitis virus.

Of the group of glycols and their derivatives tested, the most effective inactivator of the encephalomyelitis virus diluted in saline was the methyl ester of thioglycolic acid, followed by thioglycolic acid. Both were without effect on the virus diluted in broth serum.

The inhibitory effect of pyridoxine on the activity of quinine and atabrine against avian malaria, A. O. SEELER (*Jour. Nail. Malaria Soc.*, 4 (1945), No. 1, pp. 13-19, illus. 1).—Massive doses of pyridoxine were found to inhibit the activity of minimal effective doses of quinine and atabrine against *Plasmodium lophurae* and *P. cathemerium* infections of Pekin ducklings. The acute oral toxicity of atabrine and quinine for mice was, however, not influenced by pyridoxine.

**Psittacosis:** Occurrence in the United States and report of 97 percent mortality in a shipment of psittacine birds while under quarantine, G. L. DUNNABOO and B. C. HAMPTON (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 13, pp. 354-357).—A report is given of a shipment of 113 mixed Amazon parrots and parakeets on June 1, 1944, which on entry to quarantine at Brownsville, Tex., resulted in the death of 108 birds infected with psittacosis, complicated by the finding of *Salmonella* organisms disseminated through the organs of some of the birds. The potential health hazard is emphasized.

**Salmonella infections of the domestic animals:** Their relationship to salmonellosis (food infection in man), F. W. SCHOFIELD (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 3, pp. 62-68, illus. 1).—The more important salmonella infections are discussed in their relation to food infection and its prevention.

**Trichiniasis:** A review of the clinical picture and laboratory diagnosis of the disease, with an analysis of several cases (*Triquinosis: Examen del cuadro clínico y procedimientos diagnósticos de laboratorio (comunicación de varios casos)*), O. H. P. PEPPER and R. S. DÍAZ RIVERA (*Puerto Rico Jour. Pub. Health and Trop. Med.*, 20 (1945), No. 3, pp. 367-376; *Span.*, pp. 377-388).—The authors state that this disease has never been reported in Puerto Rico, despite the large use of pork products, indicating that its absence may be associated with the thorough cooking practiced there. Cases diagnosed in Pennsylvania are presented to show "the great variability of symptoms and the difficulties encountered in establishing a clinical diagnosis of this condition."

A simple rapid flocculation slide test for trichinosis in man and in swine, H. SUESSENGUTH and B. S. KLINE (*Amer. Jour. Clin. Pathol.*, 14 (1944), No. 9, pp. 471-484, illus. 2).—A test is described as simple, specific, and sensitive which requires less than 10 min. Repeatedly positive results were secured over a period of months with 11 swine experimentally infested, together with negative results in 12 animals before infestation and in 157 abattoir hogs. In the average case, the flocculation reaction became positive about 3 weeks after infestation in man and in swine.

The test is based on the observation that an alkaline aqueous extract of powdered trichinae larvae possesses the property of coating cholesterol crystals and of acting as a specific and sensitive antigen. "Since the average life span of swine fed for market is about 1 yr. and since antibodies to trichinae are detectable by the flocculation slide test for as long as 10 mo. after infestation, better prevention of trichinosis in man than thus far achieved can probably be accomplished by the routine use of this simple test on hogs at the time of slaughter and by proper disposal of the animals giving a positive reaction. The collection of the blood requires no modification of the present routine in abattoirs and the testing of a considerable number of samples can be done by one technologist in a matter of minutes."

The possibility is suggested that "extracts of other injurious agents may behave

similarly and permit the preparation of specific and sensitive antigen emulsions for flocculation tests for the detection of the diseases they produce."

The fight against tuberculosis in Montreal, L. LADOUCEUR (*Canad. Jour. Pub. Health*, 36 (1945), No. 1, pp. 22-26).—Although this address deals largely with other phases, it is stated that "the importance of the bovine bacillus has not been neglected, and tuberculosis of the ganglia and bones is surely on the decline since herds have been tuberculin-tested, sick cattle have been killed, and milk has been pasteurized. Milk sold in Montreal is now pasteurized in the proportion of 96.4 percent."

Report on diseases of farm livestock.—Section 3, Parasitic diseases of bovines (*Vet. Rec.*, 57 (1945), Nos. 6, pp. 57-65, illus. 1; 7, pp. 73-79; 8, pp. 85-90, 91).—In this series of articles, the first deals with helminthiases, the second with diseases caused by protozoa and by some arthropods, and the third with diseases caused by other arthropods. A table summarizing the parasitic diseases of cattle concludes the series.

Reviews of the progress of dairy science.—Section E, Diseases of dairy cattle, P. S. WATTS (*Jour. Dairy Res.* [London], 13 (1944), No. 3, pp. 340-370).—These reviews for the period March 1940-March 1942 deal with mastitis, contagious abortion, and tuberculosis. A list of 239 references is appended.

Differential diagnosis of vitamin A deficiencies and related ailments in cattle, J. W. PATTON (*Vet. Med.*, 40 (1945), No. 5, pp. 163-167).—The author discusses the differential diagnosis of vitamin A deficiency (acetonemia), parturient paresis, metritis, plant poisoning, and atony of the rumen. A chart showing the differential symptoms is appended.

Brucellosis of cattle (Bang's disease), R. O. C. KING and R. M. KINROSS (*Agr. Gaz. N. S. Wales*, 55 (1944), No. 12, pp. 537-539, 552, illus. 1; 56 (1945), Nos. 1, pp. 35-38, illus. 2; 2, pp. 80-82; 3, pp. 133-136).—The first installment of this article deals with losses caused by the disease, its cause and symptoms; the second, with such aspects as methods of diagnosis, introduction, and spread within a herd; the third, with the course of the disease, natural recovery, treatment with drugs, and factors affecting eradication from infected herds; and the fourth with plans for eradication and control by vaccination.

Panel discussion on brucellosis, W. L. BOYD ET AL. (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 816, pp. 135-144).—This is a revised transcript of the panel discussion at the 1944 session of the American Veterinary Medical Association.

Brucellosis in India, J. B. POLDING (*Indian Vet. Jour.*, 21 (1944), No. 3, pp. 141-149).—A survey on the prevalence of brucellosis in India and the species involved revealed that of 46 strains secured 22 were typed as *Brucella abortus*, 18 as intermediate between *abortus* and *melitensis*, and 3 as *melitensis*. Cattle found affected most were cross-bred cattle of European blood, buffaloes, and indigenous breeds, respectively. Abortion rates were lower in well-managed herds as compared with cattle on scattered farms and in villages. There was a higher prevalence of the disease in wet climates, indicating that sunshine and hygiene play an important part in control. The author states that in India it is impossible to test herds frequently enough to make the agglutination test practical, consequently it is used only to verify a diagnosis of Brucella infection. Control is based mainly on hygiene. Vaccination is being used to a limited extent in India.

The differential diagnosis of bovine brucellosis from the bactericidal action of blood plasma, I. F. HUDDLESON, E. WOOD, and A. CRESSMAN. (*Mich. State Col. and U. S. D. A.*) (*Science*, 101 (1945), No. 2623, pp. 358-359).—In a comprehensive in vitro study of the bactericidal and growth-inhibiting action of bovine blood plasma for *Brucella abortus*, sufficient differences were found in the action

of plasma from infected and noninfected cows to differentiate one from the other regardless of the agglutination titer.

The method which proved to be the most practical and the least involved and at the same time reveals more distinct differences between the action of plasma of normal, immune, and infected animals is as follows: Each plasma sample was diluted twofold in tubes of Tryptose broth from a 1:10 dilution to 1:1,280; the final volume in each tube was 5 cc. plus 0.1 cc. of diluting fluid containing  $1.5 \times 10^6$  live organisms. The tubes were incubated for 48 hr. at 37° C. The results were recorded at the twenty-fourth and forty-eighth hour. The action of the plasma was measured by the absence or degree of growth (turbidity) in the tubes as compared with that in a control tube inoculated at the same time. The organisms multiplied sufficiently during the first 24 hr. to produce considerable turbidity in the control tube of the medium. The medium remained clear in those tubes in which growth was completely inhibited. In tests of a large number of cattle of different statuses toward *Brucella* infection, not in a single instance has a plasma sample from infected animals inhibited the growth of *B. abortus* in any of the dilutions employed routinely.

Plasma samples from heifers and adult cows after exposure to and recovery from natural infection inhibited the growth of *B. abortus* in a higher dilution than those from normal ones. This also occurred in plasma from cows injected with a new type of killed *Brucella* vaccine. Thus far, the growth inhibition test has proved to be a highly accurate means of identifying both young and adult cows that are infected with *B. abortus*, and whose agglutination titers range from 1:25 to 1:5,000. "The test can easily be developed into a routine laboratory procedure and by its application bring about the retention of many cattle that might otherwise be disposed of because of the possibility of infecting other cattle."

**Sulphonamides in the treatment of brucellosis,** L. E. W. BEVAN (*Vet. Rec.*, 57 (1945), No. 13, pp. 145-146).—The author discusses the article by Stableforth, previously noted (E. S. R., 93, p. 70), indicating that in certain circumstances the sulfonamides may exert a specific curative effect on *Brucella abortus*, but concluding that, at best, "the action and uses of sulfonamides in veterinary practice are somewhat empirical."

**Bovine coccidiosis: From carrier to clinical case,** D. C. BOUGHTON. (U. S. D. A.). (*North Amer. Vet.*, 26 (1945), No. 3, pp. 147-153, illus. 2).—The author generalizes that while calves and coccidia are practically inseparable, clinical coccidiosis is preventable. Severity of infection is, in general, found proportional to the number of sporulated oocysts ingested. The roles played by various levels of infection in outbreaks among dairy calves are considered. The author's concept of the sequence of events from carrier to clinical case is presented diagrammatically. It is concluded that the first clinical infections to appear in a group are not contracted directly from carrier animals, but, rather, are the result of contact with calves harboring significant coccidial infections, in which, although relatively few symptoms may be produced, the multiplication of the coccidia creates a prodigious increase in parasite population.

Following brief descriptions of typical symptoms, gross pathology, and microscopic findings, consideration is given to the relative significance of large and small numbers of oocysts in the fecal sample. It is concluded that large numbers, on the order of 5,000 to 10,000 per gram of feces, are ordinarily indicative of severe infection, but that a low oocyst count does not necessarily imply an absence of clinical coccidiosis. It is pointed out that, because the disease is highly contagious under crowded conditions, the diagnosis of a single case in a group of calves is sufficient reason to hold the group suspect. A routine procedure for examining calves for coccidiosis is outlined.

Brief descriptions are given of 10 of the species of coccidia that have been reported from cattle. The 3 species primarily responsible for morbidity and mortality in dairy calves in the Southeastern States were: *Eimeria ellipsoidalis*, *E. bovis* (syn. *E. smilhi*), and *E. surnii*. In a series of 2,492 fecal samples from cattle of all ages, these species were present in 44.7 percent, 40.7 percent, and 42.2 percent, respectively, of the samples.

It is pointed out that the key to successful control is the prevention of excessive exposure. A scheme for preventing coccidiosis in dairy calves by segregating the calves according to specified age groups is presented. The beneficial results claimed for some treatments that have been carried out under uncontrolled conditions are deemed possibly apparent rather than real, because—*infections of cattle coccidiosis being more or less self-limiting—spontaneous recovery is to be expected in a large proportion of cases.* The theoretical and practical difficulties of treating clinical cases are emphasized. It is concluded that, although control is to be preferred to treatment, the use of a drug (such as sulfaguanidine) that has been shown to have some action against bovine coccidia may be justified in certain instances in which an early diagnosis makes it possible to instigate treatment before the intestinal mucosa has been damaged beyond repair.

A handbook on fast milking and the early control of bovine mastitis (*Rockford, Ill.: City Dept. Pub. Health, 1944, pp. 18+*).—In this handbook, "an attempt has been made to evaluate (a) good cow management and (b) good milking practices in terms of their effect on the prevention of early mastitis."

*Corynebacterium equi* in chronic pneumonia of the calf, D. F. HOLTMAN. (Univ. Tenn.). (*Jour. Bact.*, 49 (1945), No. 2, pp. 159-162).—An organism, identified as *C. equi*, was isolated from purulent lesions in the lungs of a calf dead of chronic pneumonia of several months' duration. No other organism was associated with it in the lesions. The organism was pathogenic to a rabbit upon intradermal but not upon intratracheal inoculation.

The organism redescribed, and, in view of its infectiousness for animals other than the horse, the suggestion is made that its name be changed to one descriptive of the pathology of the disease.

Two distinct diphtheroids isolated from cases of infectious bovine pyelonephritis, E. S. FEENSTRA, F. THORP, JR., and C. F. CLARK. (Mich. Expt. Sta.). (*Jour. Bact.*, 49 (1945), No. 2, p. 202).—Some of the morphological, staining, cultural, biological, fermentation, and agglutination properties of 19 diphtheroids from cases of infectious bovine pyelonephritis have been determined. Thirteen of the organisms were indistinguishable from *Corynebacterium renale* as described by Bergey (E. S. R., 81, p. 489). "The properties of the other 6 organisms would not seem to allow them to be classified with any of the corynebacteria now described."

An instance of phagocytosis of *Trichomonas foetus* in bovine vaginal secretions, D. M. HAMMOND and D. E. BARTLETT. (U. S. D. A.). (*Jour. Parasitol.*, 31 (1945), No. 1, p. 82).—Observations made on a vaginal discharge from a heifer undergoing an initial infection with *T. foetus* revealed fluctuations in the number of trichomonads present, which is ascribed to a defensive leucocyte action. In one instance a leucocyte containing an actively moving body within a large vacuole was seen. This is thought to have been a trichomonad in process of being phagocytized.

Worms in sheep, goats, and cattle: Different types and their control, H. O. MÖNNIG (*Farming in So. Africa*, 19 (1944), Nos. 224, pp. 711-720, illus. 10; 225, pp. 764-774, illus. 3).—Parts 1 and 2 of this account deal with flukes (pp. 713-718) and tapeworms (pp. 178-720, 732); part 3 with the round or wireworms (pp. 764-770); general control measures are appended (pp. 770-774).

Lymphoblastoma in a pig, H. C. H. KERNKAMP. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 816, pp. 155-156).—A case is described

in which the first symptoms to attract notice, a partial paralysis of the posterior parts of the body, appeared when the pig was only 53 days old.

Collected observations pertaining to hog cholera, L. VAN ES and J. F. OLNEY (*Nebraska Sta. Res. Bul. 135* (1944), pp. 35; *abs. in Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 817, pp. 211-212).—This bulletin is in five parts.

I. *Salmonella suis* in vaccination "breaks" (pp. 1-8).—From experiments made in 1939 and 1940, it is concluded that "there is reason to believe that at least a part of the so-called vaccination breaks was due not to the cancellation of immunity to hog cholera but to the innate capacity of *S. suis* to produce disease with or without the help of the filterable virus."

II. *Excessive serum dosage as a possible cause of vaccination breaks* (pp. 8-13).—Experiments in 1941, 1942, and 1943 indicated that, in anti-hog-cholera-vaccination practice, serum dosage at the rate of 0.2 cc. per pound live weight is likely to bring disappointing results; the rate of 0.43 cc. can be recommended as safe; the rate of 0.86 cc. may not constitute a hazard, but seems to be a waste of serum; and the rate of 1.72 cc. is not only wasteful but may also be an important factor in disappointing vaccination results.

III. *Experiments with crystal-violet hog cholera vaccine* (pp. 13-28).—Although the results of the experiments described showed that on the whole the products used did not engender an immunity comparable to the one induced by the simultaneous serum-virus method still widely used, there "can be no doubt that crystal violet has a decided attenuating influence on the virus of hog cholera. There seems to be good reason to believe that this means of attenuation may eventually lead to the development of a true vaccine, the use of which would result in a stable and constant immunity of pigs treated with it. Nor can there be any doubt of the elimination of the virulence of the hog cholera virus in the course of the preparation of the vaccine. In the 28 separate pen experiments, the untreated control pigs, which for a period of 30 days cohabited with the vaccinated ones, in not a single instance showed evidence of active virus transmission."

Observations made in connection with the yard experiment suggest the possibility that "the immunity engendered by the c. v. vaccine may possibly be of a rather transitory character and be completely lost after a given period. On the other hand, if the pigs concerned happen to be exposed to the infection during the period when their resistance is still intact, a more enduring resistance could develop as a result of such an exposure."

IV. *Experiments with hog cholera vaccine (tissue origin)* (pp. 28-33).—Pen and yard experiments indicated that, "as in the yard experiment with crystal violet vaccine, the results in the pigs vaccinated with the tissue vaccine were highly unsatisfactory. The possibility suggests itself that the immunity induced by the two newer vaccines may be of a transitory character disappearing gradually. Successful results may depend on actual exposure to hog cholera during the period when a measure of immunity is still available."

V. *Phenolized hog cholera virus as a possible vehicle for pathogenic contaminants* (pp. 33-35).—Bacteriological examinations and inoculation into pigeons of 252 samples of hog cholera virus produced by 42 different concerns revealed *S. suis* in only 1 sample, and in no case was *Erysipelothrix rhusiopathiae* present.

Hog cholera, K. W. STOUNER (*Iowa Sta. Bul. P73* (1945), pp. 449-456, illus. 2).—This practical account takes up the cause and symptoms of hog cholera, the characteristics of the virus, post mortem findings, protection against the disease, when to vaccinate, management after vaccination, and hog cholera vaccine.

Attempts to infect swine with *Salmonella suis* cultures and necrotic material from the intestinal tract, R. GWATKIN and I. W. MOYNIHAN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 3, pp. 71-76).—Following the

failure to establish infection previously noted (E. S. R., 91, p. 197), strains of *S. suisstifer* were obtained from other sources, including three from Alberta, one each from Illinois and Minnesota, and three each from Nebraska and New York. In general, the results were the same as previously, and in consequence the authors "feel that it is more than ever true that there is need for a new concept of the etiology of the condition usually known as necrotic enteritis, in which until recently *S. suisstifer* has been considered as the specific etiological factor."

El empleo del alcohol por vía venosa en el tratamiento de las afecciones pulmonares del equino [The venous use of alcohol in the treatment of pulmonary affections of the horse], F. R. DAMONTE and H. R. CAMBEROS (*Buenos Aires Univ., Rev. Facult. Agron. y Vet.*, 11 (1944), No. 1, pp. 50-62; Eng., Portug. abs., pp. 61-62).—Venous injections of 75 animals with 33 percent alcoholic solution, 0.5 cc. per kilogram of body weight and repeated at intervals according to the gravity of the attack, were used in cases of equine adenitis and bronchitis. Of the 57 cases for which observations were obtained, 52 recovered, 2 were unimproved, and 3 died. Where the diagnosis was bronchopneumonia, pneumonia, pleurisy, or pulmonary gangrene, the results were less favorable. The authors consider the sulfa derivatives and penicillin to be of greater therapeutic value, but point out that these are more expensive and not always available.

Some observations on the relationship of *Alternaria tenuis* to canine eczema, T. ALLEN (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 816, pp. 163-164, illus. 1).—The author found ragweed pollen granules in 100 percent of the skin scrapings from eczematous dogs, but spores of *A. tenuis* were present in only 25 percent of the scrapings and the same proportions were present in scrapings from normal dogs. He concludes that the claim that *A. tenuis* is the principal cause of canine eczema has not been substantiated.

Canine filariasis: A study of 100 cases, G. B. SCHNELLE, T. O. ROBY, R. M. YOUNG, and T. C. JONES (*North Amer. Vet.*, 26 (1945), No. 3, pp. 155-164, illus. 5).—A detailed study at the War Dog Reception and Training Center, Front Royal, Va., is reported. Fuadin, administered with equal effect either intravenously or intramuscularly, cleared the blood stream of circulating microfilariae in 81 dogs, although 2 later were destroyed because of chronic cystitis. Only 2 dogs died while under treatment for filariasis, but 17 were destroyed without treatment because of unfavorable prognosis. Symptoms of toxicity were successfully handled by the administration of fluids, sulfadiazine, multivitamin capsules, and temporary discontinuance of fuadin therapy. The importance of a careful urinalysis and complete physical examination is emphasized.

Calcium in prevention and treatment of experimental DDT poisoning, Z. VAZ, R. S. PEREIRA, and D. M. MALHEIRO (*Science*, 101 (1945), No. 2626, pp. 434-436).—Experiments with dogs rendered susceptible to DDT are reported in which intravenous injection of a 10-percent solution of calcium gluconate resulted in their recovery from toxic doses. It is suggested that the apparent neurologic symptoms observed in dogs experimentally intoxicated by DDT are consequent to hypocalcemia and not due to direct action of DDT upon the central nervous system.

Avian pneumoencephalitis—new respiratory disease—responds to vaccination, J. R. BEACH. (Univ. Calif.). (*Poultry Tribune*, 51 (1945), No. 4, pp. 12, 71-74, illus. 4).—It is stated that this disease has not as yet been identified definitely outside of California. The symptoms are described, and results of laboratory and field vaccination tests are presented. See also a previous note (E. S. R., 90, p. 106).

The occurrence in England of outbreaks of disease in poultry resembling the "so-called pullet disease" of America, R. F. GORDON and J. D. BLAXLAND (*Vet. Jour.*, 101 (1945), No. 1, pp. 3-9, illus. 1).—Twenty recent outbreaks of disease in poultry in England and Wales, said to resemble the so-called pullet disease

in the United States as noted by Jungherr and Levine E. S. R., 86, p. 96), are described. Although the mortality rate is low, it is accompanied by a serious drop in egg yield in the flock, and the condition is of considerable economic importance. The outstanding symptoms are "blue comb," distended crop, and decreased egg production, while the characteristic postmortem findings are nephritis, visceral gout, and ovarian degeneration. So far the etiology is obscure.

*Salmonellas distintas de S. pullorum y S. gallinarum en aves "reaccionantes"* [Salmonellas distinct from *S. pullorum* and *S. gallinarum* in avian "reactors"], J. J. MONTEVERDE and D. H. SIMEONE (*Buenos Aires Univ., Rev. Facult. Agron. y Veter.*, 11 (1944), No. 1, pp. 31-41; *Eng., Portug. abs.*, pp. 40-41).—The isolation in hens reacting in the presence of the pullorum antigen is reported for *Salmonella newport*, *S. brandenburg*, *S. goettingen*, *S. thompson*, *S. typhimurium*, *S. poona*, *S. maleagridis*, *S. onderstevoort*, and one probably new type possessing somatic antigen XXIX and a new flagellar antigen. Of these, *S. brandenburg*, *S. goettingen*, *S. poona*, and *S. onderstevoort* are thought to have been isolated for the first time in poultry.

The effect of sulfonamides in reducing mortality from pullorum disease in the domestic fowl, J. M. SEVERENS, E. ROBERTS, and L. E. CARD. (Univ. Ill.). (*Poultry Sci.*, 24 (1945), No. 2, pp. 155-158).—In these experiments with a highly susceptible strain of Rhode Island Red chicks, seven sulfonamides were tested with respect to their ability to reduce mortality from pullorum disease. Sulfadiazine and sulfamerazine were found to be the most effective, judged by both mortality and rate of gain of the surviving chicks. Sulfasuxidine, phthalylsulfathiazole, and sulfanilamide were the least effective of the drugs used, while sulfathiazole and sulfaguanidine were intermediate in their effect. Sulfamerazine and sulfadiazine also proved effective in preventing mortality if administered after development of visible symptoms of pullorum disease. A close agreement was found between the amount of free sulfonamide found in the blood and the effectiveness of the drug. At 9 mo. of age, female survivors which had been treated when 1 day old with sulfadiazine and sulfamerazine gave negative reactions to pullorum agglutination tests.

Grasshoppers: A potential danger to turkeys, A. B. WICKWARE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 3, pp. 80-81).—An autopsy is noted on a turkey hen in which the distended crop was found to be filled with grasshoppers identified as *Melanoplus femur-rubrum* (Deg.) and *M. mexicanus* Sauss. Death in other cases is cited as due to the hard parts of the grasshopper, particularly the heavily spined legs, not only irritating but actually puncturing the crop. The feeding of a liberal quantity of mash in the morning during the late fall months is suggested as a wise precaution against gorging on living grasshoppers on the range.

## AGRICULTURAL ENGINEERING

Rural industry—A challenge for agricultural engineers, C. J. HURN (*Agr. Engin.*, 26 (1945), No. 2, pp. 55-60, illus. 2).—Finding the term "rural industry" ill defined, the author designates as such for the purposes of his present discussion "an activity in which the predominant man power resides on the farm, and where modern technology is applied to fabricate, process, or otherwise transform products into a more finished state." Purposes for which such farm area industries should exist are to provide full or part-time employment of a certain number of rural people who otherwise might not find creative and profitable employment locally; to increase farm incomes in the area served through processing of crops; and, by giving economic opportunities for a diversity of employment in a given community, to keep rural areas more stable. Development of this thesis is based

mainly upon such rural industrialization as the author holds to be practicable and desirable in the area involved in the activities of the Tennessee Valley Authority. Some topics of the discussion are farm population and rural industry, agricultural processing industries, rural industry on farms, a basic front to national security and stability, and opportunities to implement rural industries. A discussion of the author's paper by F. F. Price (Oregon State College) is appended.

**Postwar objectives for agricultural engineers,** L. E. HAZEN. (Okla. A. and M. Col.). (*Agr. Engin.*, 26 (1945), No. 2, pp. 65-66).—The author, as chairman of a new committee on postwar objectives, briefly presents a tentative set of objectives for criticism and extension.

**Vertical farm diversification,** T. D. MORSE (*Agr. Engin.*, 26 (1945), No. 2, pp. 61-62, 66, illus. 1).—The author holds that "as long as farmers continue to be primarily producers of raw materials, most of them will remain near the economic level of peasantry. That has been the general pattern of earning and living for most farmers down through the ages. It will continue until a more constructive program becomes effective." Of the greatest promise as remedies for this situation, in the author's opinion, are the newer developments in the use of farm products as materials of chemical industry and especially the chemical utilization of products now considered wastes and the related development of farm processing of the farm's raw material product to a degree not hitherto practiced, together with packaging and special marketing. The last-named extension of farm work is that designated "vertical diversification" as distinguished from the "horizontal diversification," consisting in the production of a greater variety of crops. The article cites numerous illustrative possibilities of the sort of development advocated.

**Surface water supply of the United States, 1943.—Part 7, Lower Mississippi River Basin** (*U. S. Geol. Survey, Water-Supply Paper* 977 (1945), pp. 388+, illus. 1).—This records measurements of stream flow for the year ended September 30, 1943.

**Water levels and artesian pressure in observation wells in the United States in 1942, parts 5, 6, O. E. MEINZER, L. K. WENZEL, ET AL.** (*U. S. Geol. Survey, Water Supply Papers* 948 (1944), pp. 194+, illus. 6; 949 (1944), pp. 344+, illus. 19).—These parts continue the series (E. S. R., 92, p. 840), dealing respectively with the conditions observed in the Northwestern States and with those of the Southwestern States and Hawaii.

**Federal-State cooperative snow surveys and irrigation water forecasts for Columbia Basin, May 1, 1945** (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1945, pp. 10+, illus. 1).

**California cooperative snow surveys** (*Calif. Dept. Pub. Works, Div. Water Resources, Coop. Snow Surveys, 1945*, Apr. 10, pp. 24+, illus. 1; May, pp. 19+, illus. 1).

**Report on tests made on three types of flume entrance,** F. W. BLAISDELL and A. N. HUFF. (Coop. Minn. Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1944, pp. 24+, illus. 11).—The authors present in this report results of nine tests made on variations of flume entrances of a U-type; of that having 2:1 wing walls; and of that having circular wing walls. The findings are summarized in accompanying drawings and design charts that show, for each type of entrance: (1) Rating curves; (2) the width of flume required to handle various discharges at heads within the limits covered by the experiments; (3) depths in the flume at several stations as a function of the discharge; and (4) the depth of flow at several stations near the entrance to the flume for several heads within the range of the experiments. Information on the depth of flow when air is entrained is also recorded.

**Bed-load transportation in Mountain Creek,** H. A. EINSTEIN. (Coop. S. C. Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv. Serv., 1944, SCS-TP-55, pp. 54+, illus. 32*).—The experiments here reported on sediment transportation in Mountain Creek, in the southern Piedmont, have developed methods for collecting data on a typical small stream needed in the improvement of small valleys for crop production. They have resulted in development of methods (1) for estimating the sediment load, particularly the heretofore unmeasurable bed load, of small streams, (2) for estimating the effects, in small valleys, of reducing sediment loads through conservation practices, and (3) for estimating the effects of channel improvements, such as cut-offs, on flooding and channel sedimentation.

With regard to the design of apparatus for the measurement of that part of the bed material in movement that cannot be measured as suspended load because it moves close to the bed where its velocity cannot be determined, it is noted that this bed material is continuously making contact with the bed and often interrupts its movement by periods of rest. The average distance between two points of rest has been measured as about 100 times the diameter of the grain. For an average diameter of the grain (in Mountain Creek) of 0.9 mm., this average distance would be 90 mm., or less than 4 in. The probability for longer steps decreases logarithmically, a step of 2 ft. having a probability only of 2<sup>-9</sup>, or one in 512. Therefore, if a slot 2 ft. wide in the direction of flow is made to extend completely across the stream bed 99.8 percent of this part of the bed load will be deposited in it, and in Mountain Creek, suspended-load samples showed that no significant quantity of bed material moved in suspension during the observed stages. The hopper described consists of a welded sheet-iron box with a 1-in. screen covering the open top to exclude coarse trash. This is lowered into the sandy stream bed until the top is several inches below the lowest parts of the bed. On the upstream side where the sediment approaches the hopper it assumes its natural angle of repose from the bed down to the edge of the opening. All metal walls of the hopper are steeper than this angle and, therefore, all sand will slide down to the lowest point in the hopper. The sand-water mixture is pumped continuously from the hopper into a separator-weighing tank. The bed load taken out of the stream for measurement must be returned to the bed below the hopper after the measurement to avoid a certain degree of scour downstream, which, in turn, would increase the slope and transportation upstream from the hopper.

Bed-load measurements with this equipment on West Goose Creek near Oxford, Miss., are also reported.

**Rates of sediment production in southwestern United States,** C. B. BROWN (*U. S. Dept. Agr., Soil Conserv. Serv., 1945, SCS-TP-58, pp. 40+, illus. 4*).—In this publication "an attempt is made to compile, evaluate, and translate into comparable units all of the known data that might be usable in estimating quantities of sediment carried by streams in the region embracing the Great Basin interior drainage, the Colorado and Gila River watersheds, and the Rio Grande and Pecos River watersheds above the junction of these streams." From these basic data and consideration of various factors affecting the sediment load of streams, estimates of the probable long-term average annual sediment production have been made. "It is obvious that such estimates involve a large element of personal judgment, which must be based on assumptions not subject to rigorous testing and confirmable only in the distant future when, it may be hoped, many years of substantiating records will be available."

**Construction and managements of farm ponds,** J. R. CARREKER. (*U. S. D. A.*). (*Agr. Engin., 26 (1945), No. 2, pp. 63-64, 66, illus. 6*).—A small pond is a desirable asset to a farm. Ponds larger than a few acres usually cost too much for the uses here discussed, however. A narrow depression between two opposite

slopes with a wide flat area up slope generally makes the best site. Sometimes gullies offer good sites.

Top width is a more important specification than face slope on a small dam. A recent survey of small dams failed to find a single dam built to the usual specifications of from 2:1 to 3:1 slopes. In building seven dams, the Soil Conservation Service allowed the soil to roll to its natural angle of repose. Some dams were then sloped by hand to a 2:1 slope, while others were left at the natural angle (approximately 1.5:1) on either or both upstream and downstream faces. Wave action created a 6-in. to 1-ft. shelf at the water line, but no further damage was detected. The bulldozer blade made a top width of 10 ft. A minimum width of 8 ft. for farm pond dams is suggested. To prevent seepage a core wall should extend down under each dam to impervious material free of roots and other organic matter. The three dams where this was not done all had considerable seepage. The other four, which had core walls, had little or no seepage. The material for this core should be the best cementable clay loam available. A 4- to 6-in. pipe should be placed under the dam for draining the pond; adequate spillway capacity and protection are absolutely necessary in safe pond construction: shallow areas should be eliminated from the pond; special features such as use of water for irrigation and livestock watering should be provided for when the pond is constructed.

Fish production in ponds depends on proper stocking, food supply, flood control, weed control, erosion control on the watershed, and removal of mature fish.

**Relation of engineering to the manufacture and distribution of farm electric equipment,** C. V. HOLMAN (*Agr. Engin.*, 26 (1945), No. 2, pp. 69-70).—This paper is a discussion of the relation between engineering and the manufacturing division of the farm equipment industry and the relation between engineering and the distribution division of the industry. It is contributed by the sales manager of a division of a large manufacturer of farm machinery.

**A tractor-mounted manure-loader,** H. H. DELONG (*South Dakota Sta. Bul.* 378 (1944), pp. 8, illus. 6).—The purpose of the experiment was to use materials available during wartime, to test their suitability, and to assemble them into a unit which could be made with the minimum of tools and labor. The machine built and tested was of the front-mounted type having long arms and rear lift.

The long arms were hinged to the rear axle of the tractor. The wheels of the general purpose tractor were set at their widest spacing to allow the arms to come back. The wide setting also made the steering brakes more effective when short turns were necessary in loading operations. The upright framework at the front of the tractor carried only the upper hoisting pulleys. Lower vertical guides kept the arms from sidewise movement while the fork was down and being pushed into the fork load, but no objection to spacing the uprights far enough apart so that they act as the guides for the arms was found. All parts of the frame were of steel, arc-welded together. Dual hoisting ropes were used to raise the fork.

**A survey of hay handling methods,** C. B. RICHEY (*Agr. Engin.*, 26 (1945), No. 2, p. 76).—The author presents, with only the briefest comment, a tabular summary of a nation-wide survey of hay handling methods; one of the columns indicating major methods ranked as to present importance, another, major methods ranked as to rate of increase. A tendency to change from pitch fork and wagon to buck rake (for both pick-up and transportation) or the pick-up baler is indicated as especially noticeable in the reports from the New England and other Northeastern States. Pitch fork collecting and wagon transportation is noted as a method increasing rather than decreasing in relative importance only in Georgia. Use of loader and wagon, however, is indicated as on the increase in some other Southern States.

**Partial history of haying equipment**, W. R. HUMPHRIES and R. B. GRAY (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. Inform. Ser.* 74 (1944), pp. 53+, illus. 27).—The authors cover briefly the early history of the sickle and scythes. There follows, in somewhat more detail, the development, beginning in the nineteenth century, of mowing and reaping machines, of which the first took the form of machines revolving one or more scythe-like blades. The modern principle of the reciprocating knife and slotted guards is first represented in a machine patented by Obed Hussey in 1833. The remainder of the first section of this history covers improvements leading to the mower of the present day. A second section deals with the development of the various forms of horsepower and machine power rakes and tedders. Loaders, and the growth of loader design (from 1848, when the first patent for such a machine was issued in the United States, to current designs), and stackers and bailers occupy the two remaining sections. To each section a brief list of references is appended.

**Extension work for better farm housing**, S. P. LYLE. (U. S. D. A.). (*Agr. Engin.*, 26 (1945), No. 2, pp. 71-72).—The function, advisory rather than constructional, of the Extension Service in the improvement of farm home and service buildings is the subject of a brief general discussion.

**Prefabricated structures, 1940-1944: A list of references**. (Coop. U. S. D. A.). (*Washington, D. C.: Edward S. Evans Transportation Res.*, 1945, pp. 42).—This list, compiled by the Edward S. Evans Transportation Research and the U. S. Department of Agriculture Library, contains 420 references, with index.

**An approved Washington milk house** (*Wash. State Col. Ext. Bul.* 318 (1944), pp. 15, illus. 11).—This bulletin presents some suggested milk house plans designed to meet the requirements of the U. S. Public Health Service, the Washington State Department of Agriculture, and various city health departments. It takes up specifically the location of the milk house (with respect to other farm buildings and to the free admission of sunlight), its size (minimum dimensions of 10 by 12 ft.) and arrangement; walls, windows, ceiling and roof; painting; and ventilation. General and detail drawings illustrate the designs and arrangements discussed. A bill of material for a 10 by 12 ft. milk house concludes the bulletin.

**Home built farm refrigerators**, R. N. MILLER and H. J. DANA (*Wash. State Col. Ext. Bul.* 317 (1944), pp. 32, illus. 19).—The plans and discussions contained in this bulletin are concerned mainly with the construction and operation of a cold room of 350-450-cu. ft. capacity, containing a 50-75-cu. ft. zero box, directions for the putting in of the refrigerator machinery being included. The plans call for cold room insulation with 12 in. of shavings and for insulation of the outside walls of the zero boxes with 18 in. of shavings. For a 50-cu. ft. zero box and 350-450-cu. ft. cold room, a 0.5-hp. air-cooled compressor (capacity about 3,100 B. t. u. per hour at 90° F. outside temperature) is held sufficient if the recommended insulation is used. The zero box is believed sufficiently rapid in freezing the small packages ordinarily used in farm homes, and a separate quick freezing compartment of lower temperature is not considered necessary. Lists of parts for a 50-70-cu. ft. zero box; for this box and a 350-450-cu. ft. cold room; and for both of these, combined with a 12-15-cu. ft. kitchen refrigerators, are included.

**Farm applications of bactericidal lamps**, L. P. VELoz (*Agr. Engin.*, 26 (1945), No. 2, pp. 67-68).—Where air-borne bacteria are the cause of illness, mortality, or product spoilage, bactericidal lamps can be of service. The basic application of this lamp is the treatment of the air and not the product, except where clear liquids and smooth surfaces are involved. Clear liquids such as water, and to a lesser degree some others, can be effectively sterilized.

The lamp to which reference is made is a cold cathode, low-pressure mercury arc vapor contained in a slender tube of a glass permitting the transmission of

a large part of the energy of the lamp in the bactericidal part of the ultra-violet band of wave lengths. The author points out that this lamp should be distinguished from the sun lamp, of which the radiation has relatively little bactericidal effect, and from the high pressure quartz lamp, of which the radiation covers the entire ultraviolet and visible spectrum. The use most strongly emphasized in this paper is that of preventing the spread of air-borne infections in attached compartments and brooders. Instances of marked reduction in mortality are cited. Of this use, the author further states that "a secondary benefit, perhaps as important as the reduction of mortality, is the added vigor and gain in weight the birds acquire. They feather out faster and the plumage is better, the combs are deep red and erect, and the pigmentation of the legs appears sooner and is more noticeable. Part of these benefits is undoubtedly due to the small amount of vitamin D-producing energy with which they are continually being irradiated. The bactericidal lamps produce as a byproduct a very small percentage of their output in the vitamin D part of the ultraviolet spectrum." Uses in the milk house, refrigerated storage, and hog houses are also discussed.

Farm and farm home safety, 1941-44: A list of references, J. M. McNEILL (*U. S. Dept. Agr., Libr. List 14* (1945), pp. 21).—Under the first primary heading, accident prevention, the references are classified into subgroups headed farm and home safety, quasi-agricultural industries and enterprises, and insurance. Further main headings are: Farm fire hazards, safety training and instruction, and statistics. A brief list of sources consulted and an author index conclude the compilation, which totals 336 references.

## AGRICULTURAL ECONOMICS

[Paper and notes on agricultural economics] (*Jour. Farm Econ.*, 27 (1945), No. 1, pp. 1-37, 67-213).—Included are the following papers, not noted elsewhere: Forty Years of Farm Cost Accounting Records, by A. Boss (pp. 1-17) (Univ. Minn.); Forty Years of Farm Management Surveys, by S. W. Warren (pp. 18-23) (Cornell Univ.); Thirty Years of Farm Financial and Production Records in Illinois, by M. L. Mosher (pp. 24-37) (Univ. Ill.); World Agricultural Policies and the Expansion of Trade, by R. B. Schwenger (pp. 67-87) (U. S. D. A.); The Relation of Public to Private Lending Agencies (in Agriculture) and Recent Trends in Their Development, by M. R. Benedict (pp. 88-103) (Univ. Calif.); Wage Stabilization in Agriculture, by W. T. Ham (pp. 104-120), Regional Research in Agricultural Marketing, by K. Bjorka (pp. 121-137), Postwar Irrigation Developments and the National and Regional Agricultural Economy, by M. Clawson (pp. 138-152), and Repayment Experience on Federal Reclamation Projects, by A. Joss (pp. 153-167) (E. S. R., 93, p. 84) (all U. S. D. A.); and Land-Grant College Postwar Agricultural Policy, by J. D. Black (pp. 168-175), a review of the report of the Committee on Postwar Agricultural Policy of the Association of Land-Grant Colleges and Universities (E. S. R., 92, p. 459).

The following notes are included: Effects of Changes in Output on Farmers' Costs and Returns, by S. E. Johnson (pp. 176-185) (U. S. D. A.); Student Operation of a Laboratory Farm, by W. G. Murray (pp. 185-195), and Job Analysis in Agriculture, by L. Blum (pp. 195-204) (both Iowa State Col.); Relationship of Income to Milk Consumption, by R. E. Patzig and G. Hadary (pp. 204-210), and The Relationship of Chocolate Milk to Total Fluid Milk Consumption, by G. Hadary (pp. 210-213) (both U. S. D. A.).

[Studies in agricultural economics by Louisiana State University] (*La. Rural Econ.*, 7 (1945), No. 1, pp. 8, illus. 2).—Included are a chart showing the indexes 1910-45 of estimated values per acre of Louisiana farm real estate and volume of

farm mortgage debt, and brief articles: Some Things To Consider Before Buying a Farm, by B. M. Gile (pp. 2-3, 5-6); Cotton Problems in the Adjustment Period, by F. D. Barlow, Jr. (pp. 3, 6-8); and Costs and Returns on Family Type Sugar Cane Farms in 1938, 1940, and 1942, by R. D. Bass (pp. 4-5) (E. S. R., 83, p. 259; 89, p. 738).

[Economic studies in Ohio] (*Ohio Sta. Bimo. Bul.* 233 (1945), pp. 83-86).—This number includes an article entitled Responsibilities of Cooperatives, by G. F. Henning (pp. 83-85), in which seven principles of management are developed in a study of farm cooperatives in five Ohio counties; and the usual Index Numbers of Production, Prices, and Income, by J. I. Falconer (p. 86).

[Papers presented at the twenty-third short course conference and annual meeting, Vermont Dairy Plant Operators and Managers, 1944] (*Vt. Dairy Plant Oper. and Mgrs. Assoc., Short Course Conf. and Ann. Mtg.*, 23 (1944), pp. 96, illus. 6).—Included are the following papers presented at this conference and meeting, held at Burlington November 8-9, 1944: The Future of the Agricultural College, by J. E. Carrigan (p. 5) (Univ. Vt.); Mastitis—A Progress Report, by J. M. Frayer (pp. 6-7) (Vt. Expt. Sta.); Work Simplification in the Dairy Industry, by H. G. Dunlap (pp. 8-10); How Permanent Quality Improvement May Be Achieved, by L. R. Dowd (pp. 11-15); Present Development of the Dried Milk and Milk Products Industries in the U. S. A., by P. H. Tracy (pp. 16-23) (Univ. Ill.); Post-War Opportunities in the Milk Industry, by W. A. Wentworth (pp. 24-34); The National 8-Point Dairy Program, by H. S. Eastwood (pp. 35-40), and program in Vermont, by E. L. Loveland (pp. 41-42) (Univ. Vt.); What We May Expect for Dairy Equipment in the Post-War Period, by P. R. Ziegler (pp. 43-47); Probable Future Regional Shifts in Dairying, by M. S. Parsons (pp. 48-56) (U. S. D. A.); Marketing Efficiencies in City Operations That Should Become a Part of Our Post-War Economy, by E. Merrill (pp. 57-60); Marketing Efficiencies in Country Operations That Should Become a Part of Our Post-War Economy, by S. W. Beal (pp. 61-64); Probable Phases of Development in the Post-War Dairy Industry, by P. H. Tracy (pp. 65-73) (Univ. Ill.); The Economic Benefits to the Farmer of More Uniform Milk Production Throughout the Year, by R. S. Beck (pp. 74-76) (Univ. Vt.); The Dealers' Interest in More Uniform Production of Milk, by W. H. Bronson (pp. 77-80); The Market Administrator's Interest in More Uniform Milk Production, by S. W. Tator (pp. 81-88); and Some Problems of the Dairy Industry, by E. S. Brigham (pp. 92-96).

Wisconsin agriculture in World War II, W. H. EELING, S. J. GILBERT, F. J. GRAHAM, and E. C. WILCOX. (*Coop. U. S. D. A. (Wis. State Dept. Agr. Bul.* 243 [1944], pp. 147+, about 100 illus.).—“This publication undertakes a summary of the major agricultural data bodies available for Wisconsin mainly through 1943. It undertakes to show the trends in the major series for the State and the detail of production by counties for the more important items.”

What's ahead for prairie agriculture? H. S. FRY (*Winnipeg: Country Guide*, 1945, pp. 27+).—An address before the Manitoba Agronomists and Eastern Manitoba Local of the Canadian Society of Technical Agriculturists.

Sales of Minnesota agricultural products in State and out of State, W. C. WAITE (*Minnesota Sta. Bul.* 384 (1945), pp. 12, several illus.).—At the prices prevailing in 1935 to 1939, the State provided an outlet for about 100 million dollars of Minnesota agricultural products at farm values. Products valued at twice this amount found markets outside the State. Between 1910 and 1939 the quantity of products reaching the nonfarm population of the State increased 40 percent, while the quantities moving to markets outside the State trebled.

“These tendencies have been greatly accelerated during the war period. Out-of-State sales have become nearly three-fourths of the total sales by farmers, due

largely to the unprecedented expansion of our agricultural production. Exports of Minnesota products from the United States have again reached a proportion of out-of-State sales comparable with their importance in World War I, after becoming virtually nonexistent during the thirties.

"The income received by Minnesota farmers from the sale of their products has fluctuated almost exactly in proportion to the national income in recent years. A change of a billion dollars in the national income has been accompanied by a similar change of about 5.75 million dollars in Minnesota farm sales. The value of sales to the nonfarm population of the State is likewise closely associated with the nonfarm income of the State.

"The purchasing power of agricultural products depends upon the output of industrial products as well as agricultural products. When industrial production is high relative to agricultural production, the purchasing power of agricultural products tends to be high. In the period between 1920 and 1939, agricultural exports appear to have exerted a considerable influence upon this ratio. An increase of 85 million dollars in agricultural exports tended to increase the purchasing power of agricultural products by 1 percent.

"All of this emphasizes the great stake which Minnesota farmers have in high industrial activity and large agricultural exports following the war."

Economic trends in the sweet cherry industry, S. W. SHEAR. (Univ. Calif.). (*Blue Anchor*, 22 (1945), No. 2, pp. 1-9, 32-34, illus. 1).—Production data for the United States 1924-44, the chief States and groups of States 1929-43, and the Pacific coast 1934-38 and 1939-43, the acreage by varieties in California 1937 and 1943, and price and utilization data for various periods are tabulated. Trends in the industry on the Pacific coast are discussed.

Considerations in vineyard expansion, H. E. JACOB and A. J. WINKLER. (Univ. Calif.). (*Blue Anchor*, 22 (1945), No. 1, pp. 13-16, illus. 1).—The expansion of the grape acreage, 1920-23, and its consequences; the status of raisin and table grapes; the acreage and production of wine grapes; and wine production of California in relation to wine-variety grapes available are discussed and recommendations made as to future plantings.

Possibilities of silk production and industry in California, J. B. PELLETIER ET AL. (*Sacramento: Calif. Legislature*, 56. Sess., 1945, pp. 24).—This is a report of the Assembly Interim Committee created by Resolution No. 137, dated March 23, 1943.

Costs and returns for the turkey enterprise, 1943, E. G. MISNER ([*New York Cornell Sta.*, A. E. 520 (1945), pp. 27+]).—Data for the year ended January 31, 1944, from 32 farms raising an average of 1,640 turkeys are analyzed to show the costs, returns, labor income, and the factors affecting them, from breeders, incubation, eggs, young stock, and birds marketed.

Agriculture in Alaska, P. V. KEPNER and L. T. OLDRYD. (Coop. Alaska Expt. Sta.). ([U. S. Dept. Agr.], *War Food Admin., Ext. Serv.*, [1945], pp. 8).—The Territory, its agriculture, climate, population, transportation, and the different agricultural areas are described.

The agriculture of Wales and Monmouthshire, A. W. ASHBY and I. L. EVANS (*Cardiff: Soc. Cymrodorion and Univ. Wales*, 1944, pp. 300, about 20 illus.).—This is a survey of the main features of the agriculture of Wales, with special emphasis on the years immediately preceding World War II.

[Reports of the Australian Rural Reconstruction Commission], F. J. S. WISE ET AL. ([Austral.] *Rural Reconstr. Comm. Rpts.* 1 (1944), pp. 58+, several illus.; 2, pp. 55+; 3, pp. 139+, several illus.).—The commission was appointed February 25, 1943, and was composed of F. J. S. Wise, J. F. Murphy, S. M. Wadham, and C. R. Lambert.

The first report, *A General Rural Survey*, includes a review of the Australian rural economy and discusses the place of rural industries in the economic life of the Commonwealth, the lessons from different stages in the agricultural history, the general economic factors that will influence land utilization and development after the war, the factors influencing cost of production, forestry, social conditions of rural life, and decentralization, economies between producer and consumer, etc. An appendix contains a computation of the additional farming required to supply an extra 1,000,000 people.

The second report, *Settlement and Employment of Returned Men on the Land*, reviews briefly soldier settlement after World War I and discusses the present problems and past experiences, the proposals by the Returned Sailors, Soldiers, and Airmen's Imperial League of Australia, the basic organization and division of responsibilities for finance and administration between the Commonwealth and the States, the Commission's plan for farm employment and land settlement for returned men, and the financial recommendations of the Commission. Appendixes include a table showing by States the number of original settlers and those remaining and the losses, total and per settler, as reported in a report of 1929 by Justice Pike of Soldier Land Settlement.

The third report, *Land Utilization and Farm Settlement*, includes chapters on climatic factors and land use, soil factors and topography as determinants of land use, other factors of importance in determining land use policy, and land settlement policy, with recommendations. The appendix contains a summary of the New Zealand Servicemen's Settlement and Land Sales Act, 1943.

**The dairy industry in New Zealand**, W. M. HAMILTON (*New Zeal. Dept. Sci. and Indus. Res. Bul.* 89 (1944), pp. 176, illus. about 20; also in *New Zeal. Jour. Sci. and Technol.*, 23 (1942), No. 5A, pp. 257A-283A, illus. 5; 24 (1942), Nos. 1A, pp. 1A-35A, illus. 4; 4A, pp. 157A-185A, illus. 3; 24 (1943), Nos. 5A, pp. 223A-263A, illus. 9; 6A, pp. 273-302A).—The industry is described and discussed in chapters on postwar market prospects, technological advances in production, developments in processing and transport, the land, dairy-farm labor, capital and costs of production, rural life, the organization of production, and the organization of marketing. A bibliography and a statistical appendix are also included.

**Some aspects of the farm tenure situation in Newton County, Georgia**, W. E. HENDRIX, J. C. ELROD, and W. T. FULLLOVE. (Coop. U. S. D. A.). (*Georgia Sta. Bul.* 237 (1945), pp. 63, several illus.).—This bulletin is an analysis of some of the more important aspects of the farm tenure situation in Newton County. It describes recent trends in farm tenure in the county, the tenure history of owners, tenants, and croppers up to 1936, present tenure arrangements, and the relation of the tenure pattern to type of farming, soil conservation, incomes, and other aspects of farming. The study is based mainly on field survey records and data on soils obtained from a random sample of 190 farm-operating units and 72 cropper units in 1937.

**Written father and son farm partnership agreements**, C. A. BECKER (*Ithaca, N. Y.: N. Y. State Col. Agr.*, [n. d.], pp. 12).—Included are forms for agreements where the father furnishes all owned real estate, livestock, and equipment, and the son half of the feeds and supplies; where the father furnishes all owned real estate and the livestock, equipment, feeds, and supplies are owned 50-50; and where father and son each own part of the real estate and the other items are owned 50-50. The use of the agreements is described.

**Some concepts of farm labor availability**, S. C. MAYO. (N. C. Expt. Sta.). (*Social Forces*, 23 (1944), No. 2, pp. 170-176).—The author points out the inadequacy of present technics in measuring the labor supply; with a discussion by H. Hoffsommer.

"Pay as you earn taxation" and the primary producer, C. E. RESEIGH and S. C. LANE (*Jour. Dept. Agr. So. Austral.*, 48 (1945), No. 7, pp. 294-296).—A summary of the addresses of C. E. Reseigh and S. C. Lane of the taxation department of South Australia delivered at the Agricultural Bureau Congress September 1944. The taxation plan is briefly described, and the machinery for making deductions from salaries and wages under the methods laid down, i. e., the group scheme, applicable to employers of 10 or more employees subject to deductions, and the stamp plan, applicable to employers of less than 10, is outlined.

Wartime land market activity in the State of Washington, H. V. STONECIPHER, D. DUNN, and C. N. BERRYMAN. (Coop. U. S. D. A.). (*Washington Sta. V Cir.* 21 (1944), pp. 10, illus. 6).—Information on farm land values in the State during World War II is assembled and discussed. Its basis is data from the U. S. D. A. Bureau of Agricultural Economics index of farm real estate values and land transfers and other information as to marked activity in farm land in Lewis and Whitman counties. Prices, resales, financing, and type of lenders, sellers, and purchasers are among the phases discussed. It is concluded that in these areas a striking similarity as to inflationary developments exists with the conditions prevailing during World War I.

Preventing farm land price inflation in the Midwest. (Coop. 11 expt. stas., U. S. D. A., et al.). (*Iowa Sta. Bul.* P72 (1945), pp. 420-447+, several illus.).—This bulletin, prepared by the North Central Regional Committee on Land Tenure Research, discusses the present status and outlook for land prices, the consequences of land price inflation, lines of voluntary action, legislative and administrative action to prevent inflation, and emergency land market controls.

The economics of public measures to subsidize food consumption, H. M. SOUTHWORTH. (U. S. D. A.). (*Jour. Farm Econ.*, 27 (1945), No. 1, pp. 38-66, illus. 5).—The chief objectives of the subsidy plans are stated, the chief characteristics of operation that vary listed and their economic effects differentiated, and an economic analysis relating to variable conditions developed.

"The relationships between consumption and production objectives can be summed up in two rather simple and obvious comments: First, that the easiest and cheapest way to increase the consumption of food is to make it available to those who are hungry; second, that it is easier to increase the consumption of foods people want than of foods that they don't want."

The proposed producers' butterfat price differential for the New York pool, E. G. MISNER ([*New York*] Cornell Sta., A. E. 516 (1945), pp. 15+, several illus.).—Tables and charts are included showing the volume of milk, the number of producers, and proportion of milk and butterfat in the pool March, June, and November, 1942, classified by butterfat tests; the monthly tests, amounts of butterfat, utilization of butterfat, and differentials paid (December 1943 to October 1944) by classes of utilization November 1943 to October 1944; and comparisons of the monthly differentials December 1943 to November 1944 with the present system, the proposed plan, and a uniform differential each month equal to the year's average differential.

"Fat price differentials higher in spring and summer when cost of production is lowest than in fall and winter when cost of production is highest are contrary to sound principles of milk pricing. Obviously such a pricing system would aggravate instead of relieve the fall milk shortage and accentuate the spring flush. Therefore, the method proposed is a step in the wrong direction for a producer's differential just as it is wrong for handlers' differentials. It has long been recognized that basic prices in winter should be higher than in summer to encourage winter production. The butterfat differential should be proportional to price and,

to be correct, should be higher in absolute value when the basic price is high than when the basic price is low."

A post-war foreign trade program for United States agriculture (*U. S. Dept. Agr.*, 1945, *AIS-15*, pp. 26+, *illus.* 2).—This report represents a consensus of the views of a working group chosen from the agencies within the Department most concerned with foreign trade, and is approved by the Interbureau Committee on Post-war Programs of the Department. The elements of the problem are set forth and a recommended program outlined. Lines of action are suggested and their merits and limitations discussed in sections on importance of foreign trade to United States agriculture; postwar agricultural surpluses; prevalence of government intervention in agricultural production and trade; relaxation of government intervention affecting trade as a means of facilitating trade expansion; relaxation of private intervention affecting trade as a means of facilitating trade expansion; commodity arrangements to coordinate intervention as a means of facilitating trade expansion; improvement of diets and living standards as a means of trade expansion; and efforts to create an expanding world economy and world peace.

Rural electrification after the war, J. SALISBURY, JR., ET AL. (*U. S. Dept. Agr.*, 1945, *AIS-11*, pp. 18+, *several illus.*).—"This publication tells what progress has been made in rural electrification so far, what the postwar objectives should be, why an accelerated postwar program is desirable and important, and what it should be possible to accomplish in 5 yr."

Uniform labels for consumer grades of eggs, M. W. BUSTER and H. G. F. HAMANN (*U. S. Dept. Agr., Misc. Pub.* 560 (1945), pp. 6, *several illus.*).—Recommendations are made as to color, size, printing specifications, etc.

1945 New York economic handbook: Prices received by farmers in New York, 1910-14=100 (*Cornell Univ., Dept. Agr. Econ.*, A. E. 496 (1944), pp. 50+, *about 50 illus.*).—Tables and charts show for different periods for the United States and New York data as to the production, consumption, prices, total farm products and milk and dairy products, poultry, eggs, fruits, vegetables, horses, wool, etc., and as to farm and factory wages, prices of nonagricultural products, purchasing power of different products, etc.

Seasonal variation in prices of Washington farm products, M. T. BUCHANAN (*Washington Sta. Bul.* 452 (1944), pp. 40, *illus.* 32).—Tables and charts show the variations, 1910-40, the index numbers of prices for the more important field and fruit crops; different kinds of livestock; livestock, dairy, and poultry products; and feeds.

Wisconsin farm prices, production, and income, W. H. EBLING and E. C. WILCOX. (*Coop. U. S. D. A.*) (*Wis. State Dept. Agr. Bul.* 249 (1944), pp. 152+, *about 12 illus.*).—Statistics covering periods of varied lengths are given and discussed on trends of prices, production, and farm income; average prices and indexes—annually and monthly and by crop reporting districts—of prices of different farm products; prices paid by farmers; purchasing value of products; wages of farm labor; and real estate values.

## RURAL SOCIOLOGY

Farm labor camps and city youth, W. A. ANDERSON and I. A. SPAULDING ([New York] *Cornell Sta. Bul.* 819 (1945), pp. 27, *illus.* 11).—Facts and practical suggestions resulting therefrom about the organization and management of farm labor camps for city youth are presented, as based on a study of 15 farm labor camps in the State in 1943.

What farm families spend for medical care, J. L. PENNOCK and G. M. ANGLE (*U. S. Dept. Agr., Misc. Pub.* 561 (1945), pp. 18+, *about 25 illus.*).—Medical care costs money and it is unequally distributed, particularly in rural areas. Hospitals

and scientific equipment necessary to the practice of modern medicine are lacking in some areas, inadequate in others. Recent graduates of the medical schools, even those from rural areas, are not settling in rural areas. They prefer to locate where they can earn an adequate living, consult other physicians, and have access to hospitals and other facilities necessary to continued advancement in their profession.

The report is divided into three parts. Part 1 gives information about the medical care expenses of farm families at various income levels. Part 2 discusses the difference between average expenses for large groups of families and what happens to the family pocketbook when illness strikes a particular family. Part 3 contrasts rural and urban expenditures for medical care.

The need for rural hospitals, C. H. HAMILTON (*Res. and Farming [North Carolina Sta.]*, 3 (1945), *Prog. Rpt.* 2, pp. 3, 12, illus. 2).—According to this portion of a report made by the Rural Medical Care Committee to the Governor of North Carolina, the State has 128 general hospitals, approved by the American Medical Association, containing 8,475 beds, or 2.4 beds per 1,000 population, and needs an additional 6,000 beds to bring the hospital ratio of beds to the recommended standard. Of the general hospital beds, 41.7 percent are located in six large urban counties. There are only 1,665 hospital beds for Negroes, or 1.7 beds per 1,000 population, a shortage of 2,450 beds. The need for hospitals is closely related to the need for physicians (E. S. R., 92, p. 853). Counties and communities that cannot support a full-sized hospital need public health centers, clinics, or diagnostic laboratories. The facilities of these would be equally available to all general physicians in the area, but for the time being, they should limit their services to simple laboratory and diagnostic service, minor surgical operations, obstetrics, and preventive work.

## FOODS—HUMAN NUTRITION

Changes in histological structure and palatability of beef during storage, P. PAUL, B. LOWE, and B. R. McCLURG. (*Food Res.*, 9 (1944), No. 3, pp. 221-233, illus. 6).—A histological study was made of the voluntary cross-striated muscles included in a pair of rounds and a pair of psoas major muscles from a Good grade, yearling steer. The muscles observed as raw and cooked samples were taken from two sets of roasts, one made up of the semitendinosus, semimembranosus, biceps femoris, and the vastus group of muscles, and the other made up of the gastrocnemius, adductor, and psoas major muscles. The six roasts (three from the right and three from the left of the animal) of each set were utilized after storage periods of 0, 1, 2, 4, 9, and 18 days, respectively; the roasts with no storage were cooked within 3 hr. of slaughter of the animal, and the others were wrapped and stored at 1.7° C. The roasts were cooked in open pans in gas ovens at 150° to an internal temperature of 63°-60°. Paraffin and frozen sections of raw and cooked tissues fixed in formalin and subjected to differential staining were examined. The effect of storage and the cooking data—including cooking losses and palatability factors—are discussed briefly and the histological changes in greater detail and with photomicrographic illustrations. Conclusions based on observations of the one animal are presented as follows: "The findings on the changes induced by storage indicated that the greatest increase in palatability in small cuts was obtained with a 9-day storage period. Further storage led to the development of 'high' or 'gamey' odors and flavors and to rancidity of the fat. The handling of the fresh beef incident to cutting up the muscles into individual roasts before storage of the meat was considered to hasten the appearance and dissolution of rigor. Therefore, beef hung as sides or quarters would probably require a longer time in storage for the same

changes to occur. Rigor was shown histologically by the formation of dense nodes of contracture bordered on either side in the same fiber by areas of extreme stretch. Fibers which did not contract were drawn into waves and kinks by the shortening produced by the contracted fibers. Normal rigor produced denser nodes than those caused by heat from starting cooking of the beef before the onset of rigor. The passing of rigor and progress of ripening were indicated by the appearance of breaks in the fibers. Sharp fractures usually occurred in the passively retracted fibers and granular or disintegrated areas in the stretched portions of the fibers adjacent to the rigor nodes."

The leucine, valine, and isoleucine content of meats, B. S. SCHWEIGERT, I. E. TATMAN and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Arch. Biochem.*, 6 (1945), No. 2, pp. 177-184, illus. 1).—Employing the same basal medium as described in detail by Schwiegert et al. (E. S. R., 93, p. 115) but with the appropriate amino acid omitted, a suitable microbiological assay for isoleucine has been developed, using *dl*-isoleucine with an activity of 50 percent for the standard curve. Various cuts of meat were assayed, and a tabulation of the valine, leucine, and isoleucine values of the tissues on a raw (or cooked) basis as well as a protein basis was made. Leg, sirloin, and stew cuts of veal and lamb; raw and cured ham; and beef rib, round, liver, tongue, heart, kidney, and brain, as well as veal liver, were tested. The amounts of the three amino acids were relatively constant in the meat protein, irrespective of the kind or cut of meat, the leucine averaging 7.7 percent (6.1-9.0 percent), the valine 5.2 percent (4.4-6.4 percent), and the isoleucine averaging 5.7 percent (4.6-6.3 percent). The amounts of leucine, valine, or isoleucine extracted by boiling water from the original meat, as in the preparation of purified proteins, ranged from 1.1 to 3.6 percent. The three amino acids were extremely stable during the cooking or curing processes used, since a retention of 86-106 percent (average 97 percent) was observed. Less than 2 percent of any of the three amino acids was recovered in the drippings.

A study of the bacterial flora of mackerel, J. S. KISER and T. D. BECKWITH. (*Univ. Calif.*). (*Food Res.*, 9 (1944), No. 3, pp. 250-256).—As a preliminary step in a study of the effect of fast-freezing upon the bacterial flora of mackerel, a study was made of the flora of the fish as normally obtained in the region of the California coast. "The bacterial flora of 34 mackerel was examined qualitatively. The heart, liver, muscles of the back, and contents of stomach and intestine were sampled. The cultures derived showed that the organisms preponderantly present were *Micrococcus*, *Achromobacter*, *Pseudomonas*, *Flavobacterium*, *Sarcina*, *Kurthia*, *Lactobacillus*, and *Streptococcus*. One strain of *Escherichia* was encountered. Quantitative examination of back muscle and of intestinal contents showed fewer than a thousand bacteria per gram of muscle in most instances, but the intestinal micro-organic content was occasionally of the order of  $10^6$  per gram. It was shown that a relatively simple formula based on the use of sea water was superior to fish infusion agar as a medium for the quantitative bacteriological examination of fish."

Iron content of market milk, F. A. JOHNSTON (*Food Res.*, 9 (1944), No. 3, pp. 212-217).—Sixty-one bottles of market milk distributed by 25 companies were analyzed for iron content by the method of Stugart (E. S. R., 69, p. 493), great care being taken to prevent any iron contamination in the course of analysis. The samples were from large and small companies in 12 large cities and one rural area, in various parts of the United States, and were taken at different seasons. All were pasteurized and a few were homogenized and had vitamin D added. Some were packaged in glass bottles and some in paper cartons. The iron content ranged from 0.114 to 0.650 mg. per kilogram; the median fell between 0.310 and 0.313 mg. per kilogram, and the modal group was 0.310-0.320 mg. per kilogram. These

results, discussed in comparison with other analytical values compiled from recent literature (1934-40), suggest that probably the best value to adopt for average market milk is 0.30 mg. per kilogram. This, it is pointed out, is one-seventh of the value given in current tables of food composition.

**Influence of added rennin upon curd-forming properties and peptic digestion of milk.** B. SPUR and I. J. WOLMAN (*Jour. Dairy Sci.*, 28 (1945), No. 2, pp. 129-137, illus. 3).—Normal pasteurized milks, and the same made into rennet custards, were subjected to in vitro peptic digestion under conditions patterned to reproduce with a fair degree of accuracy the conditions existing in the human stomach. Pepsin and HCl were used in the same strength range occurring in gastric juice during digestion, and conditions of temperature, motility, and pH were set up to approximate the natural state of digestion. Three commercial-type rennet preparations were used, these being so constituted that the influence of calcium as well as the rennin itself could be studied. Observations of the influence of the rennin on curd-forming properties and on proteolysis indicated a definitely smaller curd size and a somewhat more rapid rate of digestion, as measured by soluble nitrogen yield in the whey (macro-Kjeldahl determination), for the rennet custards than for the untreated controls. The presence of added calcium in the rennet powder preparation proved of inconstant importance in curd formation.

**The nutritional value of sunflower seed meal.** H. G. DAY and E. LEVIN (*Science*, 101 (1945), No. 2626, pp. 438-439).—Weanling rats fed low-temperature, solvent-extracted sunflower seed meal at 5- and 10-percent levels, as the only source of B complex vitamins, were observed for 7- and 14-week periods in comparison with rats fed similar levels of defatted wheat germ, corn germ, soybeans, and brewers' yeast. The growth, as well as the appearance of the animals, indicated that sunflower seed meal at these levels was appreciably superior to wheat-germ and corn-germ meals at comparable levels as a source of B complex vitamins; it was far superior to defatted soybean meal, but decidedly inferior to brewers' yeast in this respect. Supplementation of the basal ration containing 5 percent of sunflower meal with thiamine, riboflavin, calcium pantothenate, or pyridoxine did not accelerate the growth rate of the rats. Slight acceleration of growth occurred when both thiamine and riboflavin were fed as daily supplements, and marked acceleration occurred by administration of these two vitamins plus calcium pantothenate. Growth rate on the latter regime approximated the rate in rats fed yeast at a 10-percent level. Supplementation with all four vitamins produced no faster growth than that observed in animals receiving only thiamine, riboflavin, and calcium pantothenate. Detailed analysis of the data shows that pantothenic acid and riboflavin were limiting factors for growth in the sunflower seed meal fed at the 5-percent level. The defatted sunflower seed meal used (VioBin) was a light gray palatable powder which was satisfactorily blended with white flour and corn meal to make appetizing baked foods. These results suggest that sunflower seed may be of much more practical value in nutrition than has been recognized heretofore.

**Enrichment of flour and bread: A history of the movement.** R. M. WILDER, R. R. WILLIAMS, ET AL. (*Bul. Natl. Res. Council*, No. 110 (1944), pp. 130+, illus. 1).—In prefatory remarks it is pointed out that from its inception in 1941 until January 1943 enrichment was entirely voluntary on the part of the miller and baker except in two States where it was required by law. Since early 1943 a war regulation has required enrichment of bread, but only for the Duration, and there has been no Federal regulation requiring enrichment of flour. Except for six southern States which have now enacted laws requiring enrichment, the program after the war will depend wholly on the free-will support of individual firms unless further action is taken. Federal standards for enrichment have been set

up, but the question of whether enrichment of bread and flour shall be required must be submitted to the States. It is considered particularly important that any legislation enacted by the States be uniform in its provisions. Looking forward to State legislation to continue the program after the war, this bulletin has been prepared to review the experience with Nation-wide—although not universal—enrichment since 1941. This review gives consideration to the following matters that have been involved in the enrichment program: Launching the movement, legal implements available, successive steps in fixing present standards, issues raised at the hearings, milling and baking industries and their support of enrichment, enrichment in flour mill and bakery, progress under voluntary action, war agencies in relation to enrichment, State action on enrichment, the public health basis for enrichment, relation to other nutritional reforms, supplies and costs of enriching ingredients, and fortification of related products. Appendixes present in some detail the actions taken by various agencies with regard to enrichment.

Amino acids and related compounds in honey, H. A. SCHUETTE and C. L. BALDWIN, JR. (Univ. Wis.). (*Food Res.*, 9 (1944), No. 3, pp. 244-249).—Amino acid nitrogen was determined with some modification of the experimental technic of Lothrop and Gertler<sup>a</sup> in 16 light and 21 dark honeys from three crops representing approximately 20 floral types and all the commercial color grades. The values obtained ranged from 0.0008 to 0.0375 percent and averaged 0.0048 percent. Values for dark honeys were higher than for the light samples, but in all cases the amino acids and other ninhydrin compounds were minor components.

Out-of-date vegetable preparation rules, D. DICKINS (*Miss. Farm Res.* [*Mississippi Sta.*], 8 (1945), No. 3, pp. 2, 8).—Interviews with 1,158 homemakers in Mississippi revealed that there were numerous traditional family practices in the preparation of vegetables that were out of date in the light of newer facts concerning foods and nutrition. These practices are discussed briefly to indicate how they lessen the nutritive value of the cooked food, and practices which favor retention of nutritive values in food preparation are suggested.

Planning nutrition studies involving canned foods, J. F. FEASTER and O. R. ALEXANDER (*Indus. and Engin. Chem.*, 36 (1944), No. 2, pp. 172-176).—This paper, based on a consideration of earlier studies, advances in methodology, and the various factors involved in the several steps in the canning operation, summarizes as follows the matters which must receive attention if the results of experiments are to be translated to commercial canning practices: "Despite the volume of published work on the nutritional aspects of canned foods, relatively little may be regarded as strictly quantitative. The value of much of the early research was limited by the nature of the assay methods available. With the development of rapid, more precise, and more specific assay methods, the volume of work has rapidly increased during the past two decades. In many cases the value and reliability of the data obtained could have been improved by careful consideration of such factors as the selection of control samples, adherence to commercial practice, choice of analytical method, and proper sampling to overcome variations inherent in the raw material and in the finished product from can to can. It is hoped that in future work more cognizance will be taken of the factors which may affect the reliability of the data obtained and the validity of the conclusions reached."

It is noted that the standard practice of comminuting raw foods in 3-percent metaphosphoric acid, in extracting for the ascorbic acid determination, may result in difficulties due to failure of acid of this strength to inactivate enzymes, particularly in foods such as green peas, which are likely to be covered with plant

<sup>a</sup> *Indus. and Engin. Chem. Analyt. Ed.*, 5 (1933), No. 2, pp. 103-105.

juices as a result of the vining operation. Six-percent metaphosphoric acid was found effective in inhibiting such enzyme activity.

The conservation of food products and its different aspects, N. VON GESCHER (*Internat. Rev. Agr. [Roma]*, 33 (1942), Nos. 7-8, pp. 286T-304T).—This paper, the first in a series in which questions concerning food conservation are to be considered, deals with the following topics of general nature: (1) Problems and evolution of the conservation of food products, (2) causes of their deterioration and its prevention, (3) influence of preserving technic on agricultural production, and (4) present problems in food preservation.

Implications of nutrition and public health in the postwar period (*Detroit: Children's Fund of Mich., 1944*, pp. 206+, illus. about 50).—In this volume, constituting the proceedings of a conference held at Detroit, Mich., November 3, 1944, under the sponsorship of the research laboratory of the Children's Fund of Michigan, are assembled the papers presented at the conference as follows: Food Production for Better Health and Longer Life, by L. A. Maynard (pp. 5-19) (Cornell Univ.); Vitamins and the Health of the Nation, by C. G. King (pp. 21-38); Role of Food Technology in Improving Nutrition, by R. C. Newton (pp. 45-58); Research and Nutrition for Human Health, by F. F. Tisdall (pp. 63-82); Maintaining Dental Health, by P. C. Jeans (pp. 83-97); Importance of Proteins in Resistance to Infection, by P. R. Cannon (pp. 105-131); Nutritional Reconditioning of Children in Occupied Countries, by H. C. Stuart (pp. 133-145); Our National Diet and Future Health, by E. V. McCollum (pp. 159-171); International Implications of Freedom from Want of Food, by F. G. Boudreau (pp. 173-187); and Amino Acid Deficiencies in Man, by L. E. Holt, Jr. (pp. 191-206).

Symposium on physiological aspects of convalescence and rehabilitation (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 3 (1944), No. 3, pp. 188-274, illus. 2).—Included in this symposium, sponsored by the American Physiological Society, are the following papers dealing with the nutritional aspects of the problem: Introduction to the Symposium on Convalescence and Rehabilitation, by A. Keys (p. 189) (Univ. Minn.); Energy Metabolism and Caloric Requirements, by H. H. Mitchell (pp. 193-197) (Univ. Ill.); Problems of Nitrogen Metabolism, by J. P. Peters (pp. 197-201); Bone Metabolism, by W. D. Armstrong (pp. 201-207) (Univ. Minn.); Vitamin Nutrition in Convalescence and Rehabilitation, by A. Keys and O. Mickelsen (pp. 207-216) (Univ. Minn.); and Gastro-Intestinal Function During Convalescence, by A. C. Ivy and M. I. Grossman (pp. 236-239).

Effects of variations in dietary protein on the physical well being of men doing manual work, R. C. DARLING, R. E. JOHNSON, G. C. PRITS, F. C. CONSOLAZIO, and P. F. ROBINSON (*Jour. Nutr.*, 28 (1944), No. 4, pp. 273-281).—The aim of this study, in which the authors had the technical assistance of A. Kibler and M. Bartlett, was to utilize, in a comparison of low, high, and customary protein intake, normal young men in a natural environment carrying on their usual work regime. The subjects were 24 volunteers from the personnel of a civilian public service camp who continued on the work regime of the camp during the 12 weeks of the study, which was divided into three periods—2 weeks preliminary control, 8 weeks of modified diet, and 2 weeks of final control. In the control periods all subjects ate the regular camp diet, while in the 8 weeks of the experiment proper, one group remained on the control diet, another changed to a restricted protein diet furnishing no meat, cheese, eggs, nuts, and legumes and up to  $\frac{1}{2}$  cup of milk, and another to a high-protein diet restricted in the amounts of low-protein foods. All groups received daily 5 gm. of yeast extract fortified with riboflavin. Thorough physical examinations and clinical laboratory examinations of blood and urine were given at frequent intervals, and physical fitness was assessed each week by a so-called "Pack Test", which is described. The ordinary work of the subjects was

of varying nature, from office work to farming and forestry, and was distributed as evenly as possible among the different groups. Detailed records were kept of food intakes and subjective impressions.

On neither the low-protein diet, the daily intake of which averaged 50-55 gm., nor the high-protein diet providing 160 gm. or more (mostly of first-class protein), could any influence either deleterious or beneficial be observed on the physical vigor or efficiency of the subjects. Those on the low-protein diet felt that they were getting enough food but, especially those doing the heaviest work, became unusually hungry and felt a little weak in the late morning and afternoon, while those on the high-protein, especially the less active, tended to feel overfull and sleepy after meals. In discussing the findings, the authors call attention to the difficulty in choosing a diet really low in protein from ordinary foods, provided the calorie balance is maintained, and also in increasing the protein level above 150 gm. It is noted that the studies failed to confirm Chittenden's conclusions that a restricted protein diet improves physical well-being, although confirming his conclusion that there is no impairment of health on such a diet.

"The conclusions from this study should not be extended beyond the conditions investigated. The protein needs during growth, illness, and lactation are wholly outside the scope of this work. It is apparent only that for 2 mo. with normal men (such as laborers or soldiers) rather extreme variations in protein intake were without measurable effect either beneficial or harmful. The practical implications are that under emergency conditions a diet supplying about 50 gm. of protein, chiefly from potatoes and grain products, is not incompatible with the health of physically active young men."

Dietary protein and physical fitness in temperate and hot environments, G. C. PRITS, F. C. CONSOLAZIO, and R. E. JOHNSON (*Jour. Nutr.*, 27 (1944), No. 6, pp. 497-508).—In this report of an extensive investigation of the effect of variations in the level of dietary protein on physical fitness and metabolism, the authors acknowledge the technical assistance of J. Poulin, A. Razoyk, and J. Stachelek, who served as subjects. The experiments covered four successive periods of at least 6 weeks each, during which the subjects lived on diets nutritionally complete but varying from period to period in the content of protein, the average intake of which in the low period was 76 and in the high 149 gm. per day as compared with a normal of 105 gm. at the beginning of the experiment. In each period, physical fitness for hard work (running or walking on a motor-driven treadmill at different grades) was tested both under temperate and under simulated desert and tropical conditions. A fourth subject on a normal diet served in all the physical fitness measurements as control against the effects of training and acclimatization.

The results are presented and discussed with reference to nutritional state, physical fitness, and respiratory exchange. Observations of the nutritional state included body weight, urinary nitrogen, and plasma protein. Changes in body weight were minor, with a maximum during the high protein period. Urinary nitrogen excretion averaged 18.5 gm. daily during the high protein period and 9.5 during the low, with 12.9 and 13.5 gm. during the normal periods before and after the experiment, respectively. Plasma protein levels showed no variation. Physical fitness under temperate conditions as calculated in terms of an arbitrary score system which is described showed no changes attributable to dietary protein level, nor were there any changes attributable to the protein in performance of work in both dry-hot and moist-hot environments. Metabolism while reclining and while standing was not significantly different in the high and low protein periods, but while marching was slightly lower in the low protein period. The difference was physiologically insignificant as judged by actual performance in the heat. In discussing the bearing of the results of these experiments on certain practical aspects of human nutri-

tion, it is concluded that "for periods of at least 6 weeks dietary protein level may vary widely without affecting physical fitness for intermittent work either under temperate or under hot conditions."

**Constancy of chemical composition of serum proteins regenerated on various dietary regimes.** W. A. MURRILL and W. D. BLOCK (*Arch Biochem*, 1 (1943), No. 3, pp. 365-368).—Analysis of serum proteins regenerated by dogs on regimes providing casein, lactalbumin, beef serum, or yeast as supplements to a protein-free diet indicated no essential differences from the results obtained on a normal diet. The results are interpreted as further evidence that dietary protein has little influence upon the composition of total serum protein.

**Protein intake and heat production.** E. B. FORBES, R. W. SWIFT, L. F. MARCY, and M. T. DAVENPORT. (Pa. Expt. Sta.). (*Jour. Nutr.*, 28 (1944), No. 3, pp. 189-196)—Thus study completes a series of six, five with growing and one with mature albino rats, conducted for the purpose of determining the influence of the protein content of equicaloric diets on heat production under conditions representing normal nutritive practice. In the present series of experiments, the heat produced was measured as single values for 70-day periods by subtracting the caloric equivalents of the excreta and of the body gain from the gross energy of the food. The subjects were 11 litter triplets of weanling male rats divided into 3 groups of approximately the same weight. During the 70-day period, equicaloric diets containing approximately 10, 25, and 45 percent protein were received by the animals. The gains in live weight and in nitrogen in the 25-percent protein period were greater than on the other two protein levels, but the gains in fat decreased in the increasing order of the protein (21.68, 19.01, and 16.43 gm., respectively).

Parallel data on the distribution of average 70-day food energy of the rats studied related to the percentage of protein in equicaloric diets are tabulated for the six studies, the first five of which have been noted previously (E. S. R., 75, p. 722; 80, p. 380; 82, p. 229; 83, p. 807). "The metabolizable energy and the heat production diminished at about the same slight rate throughout the entire range of increase in the protein contents of the equicaloric diets, thus showing that it was the metabolizable energy, and not the protein content of these diets, which dominated the production of heat."

**Symposium on substitutes for animal protein in nutrition** (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 3 (1944), No. 2, pp. 110-130).—The papers presented in this symposium include the following: Introduction and Discussion of the Amino Acid Composition of Plant Seeds, by H. B. Vickery (pp. 110-115) (Conn. [New Haven] Expt. Sta.); Nutritive Value of Soybean and Peanut Proteins, by D. B. Jones (pp. 116-120) (U. S. D. A.); The Nutritive Value of Wheat Germ, Corn Germ, and Oat Proteins, by F. J. Stare and D. M. Hegsted (pp. 120-123); The Nutritive Value of Yeast Proteins, by H. E. Carter and G. E. Phillips (pp. 123-128) (Univ. Ill.); and Increasing the Use of Plant Proteins, by C. M. McCay (pp. 128-130).

**The protein problem of China.** W. H. ANOLPH (*Science*, 100 (1944), No. 2584, pp. 1-4).—In discussing the problem of nutrition in China as a whole, in which 85 to 90 percent of the population is rural, the author has indicated that "the protein intake of China is approximately 80 gm. per capita per day, 5 percent of which is animal protein. The lower digestibility of the protein in vegetarian diets causes the effective protein intake to be much less than is indicated by this figure. Attempts in the laboratory to devise an adequate diet using foods from vegetarian sources only have not met with marked success. The use of mixed cereals in the diet has provided protein of higher biological value; this habit may reflect the attempt on the part of the rural peoples to work out a more effective protein intake. It is suggested that in China some of the cereal protein in the dietary intake be replaced by more leaf vegetable protein. The question is raised as to how far it

is feasible in the war economy to replace animal protein by vegetable protein. In long-term plans for food relief in the Far East it is urged that an emphasis be placed on the protein factor."

**Inadequacy of lactose and beta-lactose as dietary carbohydrates for the rat,** B. H. ERSHOFF and H. J. DEUEL, JR. (*Jour. Nutr.*, 28 (1944), No. 4, pp. 225-234).—"Male and female rats of the Long-Evans and U.S.C. strains were placed at weaning on purified rations containing lactose,  $\beta$ -lactose, glucose, galactose, sucrose, and cornstarch as the sole source of carbohydrate. The following observations were made: (1) Rats failed to survive on purified rations containing lactose or  $\beta$ -lactose as the sole carbohydrate; (2) rats developed alopecia when fed the above lactose or  $\beta$ -lactose rations; (3) a strain difference was observed in the incidence and degree of alopecia as well as the length of survival of rats fed lactose or  $\beta$ -lactose rations; (4) rats fed a  $\beta$ -lactose ration died sooner and developed more severe alopecia than those fed a lactose diet; (5) length of survival was correlated with severity of diarrhea; and (6) a relationship was observed between degree of mortality and previous maternal diet."

**The nutritional significance of inositol,** D. W. WOOLLEY (*Jour. Nutr.*, 28 (1944), No. 5, pp. 303-314).—This review deals with inositol as a microbial growth factor and as a dietary essential for mice, rats, cotton rats, guinea pigs, hamsters, and chickens; the synthesis of inositol by animals; the question as to whether or not inositol should be regarded as a dietary essential; methods of analysis; structural specificity of inositol action; chemical structure of inositol; and natural occurrence of inositol and its derivatives. An extensive list of literature references is appended.

**An oxidative metabolite of pyridoxine in human urine,** J. W. HUFF and W. A. PERLZWEIG (*Science*, 100 (1944), No. 2584, p. 15).—The slow direct oxidation of pyridoxine hydrochloride with permanganate in neutral solution yields a product which, from physical determinations, appears to be identical with a fluorescent compound excreted in human urine after the ingestion of pyridoxine. This new fluorescent substance was isolated in crystalline form from urine treated with acid, and its structure was shown to be the lactone of 2-methyl-3-hydroxy-4-carboxy-5-hydroxymethyl pyridine, which is converted by heating with alkali to the corresponding acid form. The oxidative product excreted in human urine after pyridoxine ingestion is in the latter form. It is not excreted by dogs, and only to a small extent by rats, after the administration of pyridoxine hydrochloride.

**Symposium on human vitamin requirements** (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 3 (1944), No. 3, pp. 158-188, illus. 4).—This symposium, sponsored by The American Institute of Nutrition, consists of an introduction by C. A. Elvehjem and reviews of recent literature on the human requirements for various vitamins, prepared in each case by an authority actively engaged in research dealing with the specific vitamin in question as follows: The Human Requirement for Nicotinic Acid, by W. J. Dann (pp. 159-161); Further Studies on Human Requirements for Riboflavin, by H. T. Parsons (pp. 162-171) (Univ. Wis.); The Thiamine Requirement of Man, by L. E. Holt, Jr. (pp. 171-178); and Some Aspects of Vitamin C Metabolism, by C. J. Farmer (pp. 179-188). Each of the reviews contains an extensive list of literature citations.

**Vitamin retention in processed meat: Effect of thermal processing,** D. A. GREENWOOD, H. R. KRAYBILL, J. F. FEASTER, and J. M. JACKSON (*Indus. and Engin. Chem.*, 36 (1944), No. 10, pp. 922-927, illus. 4).—Cured pork luncheon meat processed at a high retort temperature in thermal death time (T. D. T.) cans for a short time retained greater proportions of the original thiamine, riboflavin, niacin, and pantothenic acid contents than did samples processed to the same sterilizing value at lower retort temperature for longer periods. These tests showed that at

constant temperature the degree of thiamine destruction in the pork luncheon meat was a function of time. The rate of thiamine destruction was approximately doubled with an 18° F. increase in temperature, but since the rate of destruction of heat-resistant bacteria is increased approximately tenfold with an 18° increase, the use of higher temperatures, such as attained in the T. D. T. tests, is more favorable to thiamine retention. The influence of heat treatments on pantothenic acid appeared to be similar to that on thiamine. Niacin and riboflavin in the pork luncheon meat were relatively stable.

These conclusions, reached in studies of the T. D. T. cans, are not directly applicable to commercial procedures, since the latter require greater times for penetration of the heat to the centers of the commercial-size cans. Other studies were undertaken, therefore, in which the pork luncheon meat was packed in 12-oz. or 2½-lb. cans and processed according to commercial procedures. In these trials the processing temperature did not appear to be a major factor influencing B vitamin retentions. The retentions on a commercial basis amounted to 73–76 percent for thiamine in 12-oz. cans, and only 46–60 percent and 38–49 percent in the 2½-lb. and 6-lb. cans, respectively. Riboflavin retentions in these three can sizes, respectively, were 86–95, 71–81, and 67 percent; niacin retentions were 89–97, 71–81, and 73–75; and pantothenic acid retentions were 62–73, 62–68, and 70–73 percent. The degree of B vitamin retention was found to vary with the position of the meat within the can. The thiamine content of pork luncheon meat in the center of a 2½-lb. can was fully 50 percent higher than that of meat within  $\frac{1}{2}$  in. of the can wall.

**Covitamin studies, I–III** (*Jour. Biol. Chem.*, 152 (1944), No. 2, pp. 303–311, illus. 3; pp. 313–320, illus. 2; pp. 321–328).

I. *The sparing action of natural tocopherol concentrates on vitamin A*. K. C. D. Hickman, M. W. Kaley, and P. L. Harris.—Groups of 10 rats were maintained on a modified U. S. P. diet for vitamin A assay, which contained all essential dietary factors except that it was so low in vitamin A as to fail to support life, and sufficiently low in vitamin E to respond to very small supplements of that substance. Vitamin A supplements of the crystalline alcohol or acetate, U. S. P. Reference Oil II, and molecularly distilled concentrates were used. The vitamin E supplement was a molecularly distilled concentrate of soybean and cottonseed oil products containing 40 percent of an equal mixture of  $\alpha$ - and  $\gamma$ -tocopherols with small unknown quantities of the  $\beta$ -compound. Both the vitamin A and the vitamin E concentrates were fed by calibrated dropper to obtain the maximum synergistic effect. Vitamin E at the level of 0.15 to 0.30 mg. per rat per day gave optimum results, which were evidenced by (1) lengthening of the depletion time of rats on a vitamin A-deficient diet, (2) increase in the survival time in response to a single dose (50 U. S. P. units) of vitamin A, and (3) increase in the rate of growth and survival time on a low vitamin A diet (0.46 $\gamma$  per day).

II. *The sparing action of natural tocopherol concentrates on carotene*, P. L. Harris, M. W. Kaley, and K. C. D. Hickman.—Young rats weighing about 100 gm. were fed a diet in which the carotene level varied from 0.8 $\gamma$ –30.0 $\gamma$  daily. Supplements of tocopherol concentrate were fed in amounts of from 0.015–5.0 mg. daily. Maximum weight gains, with a carotene level of 0.8 $\gamma$ –1.2 $\gamma$  per day, were obtained with a vitamin E level of approximately 0.5 mg. per day. The weight increases of the rats were roughly proportional to the amount of vitamin E supplied. Approximately 0.5 mg. of natural mixed tocopherols was the optimum daily dose to demonstrate the sparing action of vitamin E on carotene. Comparison of the amounts of carotene and of vitamin A (study I) required for equivalent growth at maximum synergy (optimum vitamin E) indicated a relative biological potency of vitamin A to carotene of 2 : 1.

III. *The sparing equivalence of the tocopherols and mode of action*, K. C. D. Hickman, M. W. Kaley, and P. L. Harris.—On a vitamin A-free diet, as used in the above studies, groups of 8 to 10 rats were fed a uniform daily supplement of  $0.5\gamma$ - $0.7\gamma$  vitamin A or  $0.8\gamma$ - $1.2\gamma$  carotene, and a molecular equivalent of different pure individual E covitamins and covitamin esters at the expected optimum concentration of 0.15-0.3 mg. per rat per day. Results indicated that (1) the action of tocoperols is repressed by esterification, (2) the synergistic action is due to repression of oxidation, since antioxidants such as ascorbic acid and lauryl hydroquinone as well as  $\alpha$ -,  $\beta$ -, and  $\gamma$ -tocopherols have a vitamin A sparing action, (3) the maximum sparing effect is obtained with a combination of tocopherol and ascorbic acid, and (4) with one exception, the maximum synergy is obtained when covitamin and vitamin A are given simultaneously and orally. The authors imply from the evidence presented that the sparing action is due chiefly to repression of oxidation in and near the gastrointestinal tract.

**Stability of carotene added to solid carriers**, E. BICKOFF and K. T. WILLIAMS. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 4, pp. 320-323, illus 3).—Carotene dissolved in chloroform and added to rice bran or various flours, with subsequent removal of the solvent by aeration, was found to suffer rapid destruction in the mixtures formed into 1-gm. pellets and stored at 37° C. exposed to air. A loss of 50-87 percent of the carotene occurred in the first 30 days. The loss varied with the type of carrier, being greater with petroleum ether extracted than with nonextracted rice bran, for example, and was greater the higher the initial carotene content of the mixture. Addition of various oils, vegetable or mineral, resulted in considerable variation in carotene stability. Oils containing natural antioxidants, such as corn or palm oil, for example, gave better protection than mineral oil. In mixtures prepared with mineral oil, stability of the carotene increased with increase in oil content up to a level of 275 mg. of oil per gram of bran, and no further increase in stability resulted upon increasing the proportion of oil. Diphenylamine was effective in stabilizing the carotene in the pelleted mixture of rice bran and mineral oil. In mixtures containing 275 mg. of oil per gram of bran, and 5 mg. of diphenylamine and 0.4 mg. or less of carotene per gram of mixture, 80 percent of the added carotene was retained after 4 mo. at 37°; similar samples with no diphenylamine retained only 2 percent. At low carotene levels (0.2 mg. per gram) diphenylamine afforded almost as much protection in mixtures prepared with corn oil as in those prepared with mineral oil, but at higher carotene levels (about 1 mg. per gram) the carotene oxidized more rapidly in the corn oil mixtures.

**Effect of the composition of the diet on the riboflavin requirement of the rat**, G. J. MANNERING, D. ORSINI and C. A. ELVERHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 28 (1944), No. 3, pp. 141-156).—The findings of a previous study (E. S. R., 86, p. 425), in which it was shown that the fat content of the diet had a marked effect on the riboflavin requirement of the rat when the carbohydrate was dextrin, have been confirmed by an extension of the earlier tests using fat at 7-, 25-, and 40-percent levels and riboflavin at daily levels of 0, 3, 6, 9, and 12  $\mu$ g. At each level of riboflavin fed, the growth of the animals on the low-fat high-carbohydrate ration was superior to that of animals on the high-fat low-carbohydrate ration. The riboflavin requirements, as shown by plotting gains in weight against riboflavin dosage, increased with the increase in fat at the expense of dextrin. The economy of food utilization calculated as grams gained per 100 Calories consumed was closely correlated with responses in growth. The substitution of dextrin by sucrose did not produce the same effect.

The suggestion that the beneficial effect of dextrin might be due to its stimulation of the production of available riboflavin by the intestinal flora of the rat was tested by determining the effect of various carbohydrates and of fat on growth and on

the fecal excretion of riboflavin on a constant intake of riboflavin, 6 µg. daily, except during periods of feces collection. The growth of rats on high dextrin, cornstarch, and alcohol-extracted dextrin was superior to that of animals fed any of the other rations, and again the substitution of lard for a large part of the dextrin had a deleterious effect on growth while a similar replacement of sucrose by lard was without effect. The inclusion of cellulose in the sucrose and lard-sucrose rations did not improve growth appreciably. With the exception of lactose-fed groups, growth was roughly proportioned to the amount of riboflavin excreted in the feces, and to a less marked degree the rats showing the best growth had feces containing the greatest amount of riboflavin per gram. With certain exceptions, the total amount of riboflavin excreted in the feces was related to the size of the cecum as a measure of the dry weight of the cecal contents. The relationship between growth, size of cecum, intestinal synthesis, and quantity of riboflavin in the cecum and feces is discussed. It is considered important that "investigators conducting vitamin balance studies recognize that riboflavin is produced in significant quantities by bacteria in the tract, and that the amount of riboflavin in the feces is largely independent of the amount fed in the diet."

It is noted, finally, that the feeding of high levels of dietary fat to riboflavin-deficient rats results in a spastic paralysis of the hindquarters, a condition not noted to any extent on high carbohydrate diets.

**Food utilization and appetite in riboflavin deficiency.** G. J. MANNERING and C. A. ELVEHEM. (*Wis. Expt. Sta.*). (*Jour. Nutr.*, 28 (1944), No. 3, pp. 157-163, illus. 3).—During the course of the experiments noted above, an opportunity was afforded to study the effect of riboflavin on food utilization by computing the amount of growth per Calorie of food consumed in groups of rats on the riboflavin-low rations supplemented with graded suboptimal levels of riboflavin. Three-week-old male rats weighing 35 to 40 gm. each were partially depleted of their riboflavin reserve before being placed on the various rations with the graded riboflavin supplements for an experimental period of 7 weeks. As the daily intake of riboflavin was increased, less food was required for a given increment of growth. Up to 12 µg. of riboflavin, the curve of gain in weight plotted against riboflavin was linear. Corresponding curves of gain in weight per 100 Calories food consumed against riboflavin consumption was curvilinear, showing that food utilization approached a maximum at a lower level of riboflavin than growth. When the average gains per 100 Calories was plotted against the logarithm of micrograms of riboflavin fed, a straight line was obtained.

In another experiment to show the effect of riboflavin on the efficiency of food utilization for maintenance, a "paired weighing" procedure was employed in which an animal receiving a complete diet was restricted in food intake so that its weight remained equal to that of an ad libitum-fed rat receiving a diet deficient in riboflavin. The efficiency of food utilization was then determined as the amount of food necessary to maintain each of the animals at the same weight. A group of six male rats weighing between 65 and 75 gm. was fed 100 µg. of riboflavin per rat per day, with just enough of the basal ration to keep their weights equal to the weights of six other rats fed the same ration ad libitum without riboflavin. Three of the animals receiving no riboflavin died in the eleventh week and the other three collapsed during the fifteenth, sixteenth, and seventeenth weeks, while all of the starved animals remained in good condition except for emaciation. After the first week, they required progressively less food to maintain their weights at the level of those receiving no riboflavin. During the entire period, the latter ate on an average 1½ times as much food as the starved controls but became less and less active.

In a third experiment, it was shown that a moderate degree of inanition does occur in most rats suffering from lack of riboflavin, although considerable variation

occurs in the degree of anorexia. The inanition observed is thought to be insufficient to account for the deaths of the deficient rats, since a relatively high level of food consumption is maintained throughout the entire period.

Effects of thiamine and riboflavin deficient diets on rats differing in their efficiency of food utilization, R. W. LUECKE, L. S. PALMER, and C. KENNEDY. (Minn. Expt. Sta.). (*Arch. Biochem.*, 5 (1944), No. 3, pp. 395-400).—Two strains of rats inbred for 15 yr. and possessing inherent physiological differences which characterized them as "high efficiency" (HE) or "low efficiency" (LE) strains were used. A vitamin B-free basal ration supplemented with thiamine, riboflavin, pyridoxine, calcium pantothenate, and choline was fed as the normal diet, while a thiamine- or riboflavin-deficient diet was obtained by excluding the necessary vitamin from the supplement. Ten rats were used in each group, and the liver and kidney tissues were assayed for thiamine by the thiocchrome method of Hennessy (E. S. R., 87, p. 8) and for riboflavin by the microbiological method of Snell and Strong.<sup>4</sup> The feeding period for the normal controls was 6 weeks, during which time the average weight gain of the HE strain was 38 percent greater than that of the LE strain, while showing an increased food intake of only 5 percent. The deficient rats were sacrificed only after characteristic symptoms of thiamine and riboflavin deficiency appeared.

On the thiamine-free ration the LE strain animals developed polyneuritis in about 58 days, while only mild symptoms appeared in the HE strain after 90 days. Assays showed that the mean thiamine content of the liver and kidney of the LE strain was only 1.24 µg. and 1.20 µg. per gram, respectively, as compared with 6.35 µg. and 5.43 µg. per gram for the HE strain. On the riboflavin-free ration, alopecia appeared in the HE strain after only 2 weeks and increased progressively with loss of weight. After 6 weeks the LE strain showed no alopecia and but slight loss of weight; only after 13 weeks had alopecia progressed to the same point as in the HE group after 6 weeks. Corneal vascularization appeared in the LE strain at about the seventh week. Analysis of the liver and kidneys of both groups of riboflavin-deficient animals showed that when the same stage of alopecia had developed, the riboflavin content of the organs was the same. On the riboflavin-deficient diet, the thiamine content of the liver and kidney tissue was higher than in the control group. Similarly the riboflavin concentration in the liver and kidneys of thiamine-deficient rats of both strains was much greater than that found in the normal control rats.

The authors concluded that the riboflavin requirement of the HE strain was approximately double that of the LE strain, whereas the thiamine requirement of the HE strain seemed to be much lower than that of the LE strain. Reciprocal relationships between thiamine and riboflavin existed irrespective of the strain, thiamine deficiency resulting in increased riboflavin concentration and riboflavin deficiency in increased thiamine in the liver and kidney tissues of the rat.

The thiamin content of breakfast cereals, A. D. ROBINSON, M. C. HILTZ, R. CAMPBELL, and A. LEVINSON (*Canad. Jour. Res.*, 23 (1945), No. 1, Sect. F, pp. 1-8).—Thiamine was determined by the thiocchrome method of Hennessy and Cerecedo (E. S. R., 82, p. 588) but using a 1-hr. extraction period, in breakfast cereals available in Winnipeg retail stores. Prepared cereal products derived largely from wheat, from corn, from rice, and from mixed cereals were analyzed as purchased, while other products derived from wheat, oats, barley, or mixed cereals were analyzed both before and after cooking. The effect of storage was observed in the cereals resealed after removal of the original sample and stored for 1 yr. at room temperature. Some of the uncooked and prepared samples were also analyzed for thiamine by the rapid method of Hoffer et al. (E. S. R., 93, p. 7).

<sup>4</sup> Univ. Tex. Pub. 4137 (1941), pp. 11-13.

The data reported indicate that a single serving of many of the products would provide from 10 to 15 percent of the recommended daily allowance. Oatmeal, whole wheat cereals, and those containing mixtures of many grains were highest in thiamine content, while corn, rice, and wheat endosperm cereals were low in thiamine. Little loss was observed due to storage. Cooking losses varied, but most samples appeared to have less than 20 percent of their thiamine destroyed, and in half of the cases a loss of less than 10 percent was found. Some of the rolled oats and wheat endosperm cereals showed apparent gains. The short thiocchrome method of Hoffer et al., which was designed for use with flour, gave low results in application to the breakfast cereals.

**Thiamine content of vegetables: Effect of commercial canning,** L. E. CLIF-CORN and D. G. HEBERLEIN (*Indus. and Engin. Chem.*, 36 (1944), No. 2, pp. 168-171).—Thiamine was determined by the method of Conner and Straub (E. S. R., 87, p. 9), using a Coleman model 12 photofluorometer, in vegetables followed from the raw state to the final product as obtained in commercial canning operations. The over-all retention of thiamine in nine vegetables, based on the total can contents, ranged from 31 to 89 percent, the lowest retention being in corn (31-47 percent), and the highest in tomatoes (89 percent); the over-all average retention was 57 percent. Information tabulated for each of the nine products canned in this study (asparagus, green beans, lima beans, beets, carrots, corn, Perfection sweet peas, Alaska peas, and tomatoes) indicated the time and temperature of water blanching and of processing, the can size, the number of days between canning and analysis, the thiamine content in micrograms per 100 gm. of the fresh vegetable and of drained solids, liquid, and total contents of the canned product, and the calculated percentage retention. A more detailed study of the effects of preparation and canning on the thiamine content of Mary Washington asparagus, Refugee green beans, Henderson Bush lima beans, Alaska peas, and Prince of Wales sweet peas is reported in flow-sheet fashion to show for each vegetable the effect of each stage of the process on the thiamine value (corrected to the original fresh moisture basis) of the material. Of the various steps, commercial blanching and processing exerted the most pronounced influence, the thiamine retention during blanching ranging from 64 to 100 percent, and that during processing from 58 to 79 percent. The thiamine content of raw asparagus was greatest in the tips and decreased in the lower portions of the stalk, and this was reflected in the canned product, since the canned whole-spear asparagus had about twice the thiamine content of the center-cut asparagus. Difference in thiamine content between standard and extra-standard lima beans and between various sieve sizes and quality grades of Alaska peas and sweet peas were mainly due to different stages of maturity of the seeds. In most cases the same proportional differences were observed in the canned products as existed in the raw materials before canning. Storage studies indicated a decrease in the thiamine content of the canned vegetables with storage. The liquid portion of the canned products contained between 27 and 45 percent of the total thiamine of the can.

**Thiamine utilization of rat maintained on diets containing dextri-maltose,** G. A. EMERSON and H. G. OBERMEYER (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 2, pp. 216-221, illus. 6).—In this study it has been demonstrated that commercial dextri-maltose such as has been used as the carbohydrate in experiments on thiamine requirement contains 0.9 µg. thiamine per gram, by the thiocchrome method, and that this thiamine is utilized by the rat. During the course of the work, it was found that rats maintained on the rations containing autoclaved yeast showed weight increases in excess of those observed on a diet in which the heat-stable B vitamins were present in crystalline form. "The results of these experiments indicate that autoclaved yeast apparently carries factor(s) which augment the effect of small amounts of thiamine in the rat. Thus, the thiocchrome method may not measure all thiamine which, according to these bioassays, was available to the rat."

**Intestinal absorption of galactose in the rat as affected by suboptimal intakes of thiamine, J. R. LEONARDS and A. H. FRFE** (*Jour. Nutr.*, 28 (1944), No. 3, pp. 197-201, illus. 1).—In continuation of the authors' studies by the paired feeding method of the effect of a deficiency of certain B vitamins on the intestinal absorption of galactose by the rat (E. S. R., 92, p. 147), the effects of chronic deficiency rather than complete deprivation of thiamine were studied in a similar manner.

"The rate of intestinal absorption of galactose was measured in three groups of rats which were kept for 70 to 80 days on thiamine intakes of 2, 5, and 10 µg. per day, respectively. The absorption was compared with paired control animals receiving 40 µg. of thiamine per day. The rate of absorption of galactose in rats receiving these suboptimal thiamine intakes averaged 85 to 90 percent of that of the controls. The methods employed did not indicate any change in the rate of metabolism of galactose as a result of the chronic thiamine deficiency."

**The effect of thiamine depletion and restoration of muscular efficiency and endurance, J. W. ARCHDEACON and J. R. MURLIN** (*Jour. Nutr.*, 28 (1944), No. 4, pp. 241-254, illus. 2).—Experiments with the Krogh bicycle ergometer and the Benedict Universal respiration apparatus were conducted on two subjects in the postabsorptive and the postcibal states. Each day's test consisted in determining (1) the resting energy metabolism of the subject for a 10-min. period while sitting without pedalling on the ergometer and (2) the metabolism for a 15-min. period consisting of 6 min. of work at the rate of 455 kg.-m. per minute and 9 min. of recovery. Respiratory quotients were obtained and the ratio of work (in calories) to energy expenditure due to work was calculated as net efficiency. For the endurance test, which on certain days followed immediately after the muscular efficiency test, the subjects worked until exhausted at rates varying between 1,180 and 1,475 kg.-m. per minute. The low vitamin diet, reported as the menu for three meals furnishing about 3,000 calories, contained at first about 0.27 mg. of thiamine daily and later, with some modifications, less than 0.15 mg. daily. When the diet was to be increased in thiamine content, 180 gm. of peeled-wheat bread was first substituted for the unenriched bread of the original diet. Later this amount was doubled, the increase in thiamine resulting from the change in the bread amounting to 0.55 and 1.0 mg., respectively. Subsequent modifications for one of the subjects included 10 mg. of thiamine, 10 to 20 mg. of pyridoxine, and 10 mg. of riboflavin.

On the low B complex diet, muscular endurance was greatly decreased, the effect being observed first in about 10 days to 2 weeks. The endurance was increased significantly when the vitamin content was increased by the change in bread. This was also the case when thiamine hydrochloride in pure form was included. In one experiment with pyridoxine, a similar effect was obtained, but riboflavin had no effect. On a diet already adequate in the B vitamins, further additions did not increase muscular endurance.

Muscular efficiency in the postabsorptive state remained the same for moderate work even after a month on the low-B vitamin diet. The addition of the B complex, including thiamine in amounts sufficient to meet the daily requirement, did not increase muscular efficiency in the postabsorptive state. A small increase of muscular efficiency for moderate work in the postcibal state was observed in two different tests in which the B vitamins were furnished by the peeled-wheat bread. The addition of thiamine alone did not result in any increase in efficiency in the postcibal state. "It is concluded that any increase in efficiency which occurs with administration of the B complex vitamins, on low-B complex diets of at least a month's duration, is in the postcibal and not the postabsorptive state. This suggests that the entrance into the circulation and accesss to the muscles simultaneously of fuel and vitamins which promote release of energy are important."

**New components of the vitamin B complex, E. C. BARTON-WRIGHT, W. B. EMERY, and F. A. ROBINSON** (*Nature [London]*, 153 (1944), No. 3895, p. 771).—

The authors started with a commercial liver extract (Examen) and subjected it to the following fractionation procedure: Extraction with chloroform at pH 3, concentration of the washed extract in vacuo to dryness, solution of the residue in water, adsorption on Decalso at pH 4.5, followed by elution with hot 10-percent NaCl, extraction of the eluate with phenol at pH 3, and transference of the activity to water at pH 3 by addition of ether. The eluate and the combined Decalso filtrate and washings were each concentrated in vacuo to the original volume of the Examen. In this way two products were separated, an eluate and a filtrate factor. Both concentrates were found to stimulate the growth of *Lactobacillus helveticus* and *Streptococcus lactis* R when added in place of a folic acid concentrate, but in different ways. Tabulated results indicated that a synergistic effect was produced with *L. helveticus* when both factors were added, whereas with *S. lactis* the effect was additive. Neither of the chloroform-soluble factors was destroyed by nitrous acid, by acetylation with acetic anhydride in sodium hydroxide solution (at room temperature), or by benzoylation with benzoyl chloride and sodium hydroxide. The authors conclude that the chloroform-soluble factors appear to be different from folic acid or other similar factors, which are all reported to be insoluble in the common organic solvents except glacial acetic acid.

**Biotin and folic acid deficiencies in the mouse.** E. NIELSEN and A. BLACK (*Jour. Nutr.*, 28 (1944), No. 3, pp. 203-207, illus. 1).—Evidence is presented that the mouse, unlike the rat, requires biotin and folic acid for normal growth on an artificial ration. Supplementation of the ration with biotin and a folic acid concentrate gave a definite growth increase. When 0.6 percent sulfasuxidine was added to the basal ration, the mice began to lose weight after the third week and all were dead at the end of the sixth week. Supplementing the ration with a folic acid concentrate led to the production of an uncomplicated biotin deficiency, characterized by a typical alopecia which could be cured or prevented by the addition of biotin. As a similar alopecia responding to inositol was described by Woolley (E. S. R., 86, p. 714), work is in progress to determine if biotin is involved in the utilization and/or absorption of inositol.

**Growth, reproduction, and lactation in mice on highly purified diets, and the effect of folic acid concentrates on lactation.** L. R. CERECEO and L. J. VINSON (*Arch. Biochem.*, 5 (1944), No. 2, pp. 157-164, illus. 2).—Three strains of mice were reared through several generations on highly purified diets containing only five of the B vitamins, all in crystalline form (thiamine, riboflavin, pyridoxine, calcium pantothenate, and choline chloride). On these diets, growth was superior to that of controls on the stock diet, but reproduction and lactation were inferior. The poor lactation performance was considerably improved by the addition of a folic acid concentrate to the rations.

**The measurement of "folic acid."** T. D. LUCKEY, L. J. TEPLEY, and C. A. ELVEHJEM. (Univ. Wis.). (*Science*, 100 (1944), No. 2592, pp. 201-202).—Data from the authors' laboratory and other sources quoted are presented to show the difficulty in expressing folic acid results because of the existence of various standards, methods, and units of folic acid activity, of which the authors list seven. "One-half maximum" values, the approximate number of micrograms of material required to provide one-half of the maximum growth or acid production per 10 cc. of complete medium, are considered more reliable than "potency" values, since the latter depend on one more variable, that of the initial standard.

**The potato as a source of vitamin C.** G. JULÉN (*Lantbr. Högsk. Ann. [Uppsala]*, 9 (1941), pp. 294-309).—A thorough, statistically analyzed study was carried out on the influence of variety, condition of storage, cooking, and physical composition of the potato upon the ascorbic acid content. The tabulated results showed that, of 10 varieties upon which storage tests were made, the initial values ranged from 14.2 to 29.2 mg. percent and decreased to a range of 6.0 to 14.1 mg. percent after

4 to 6 months' storage. The greatest retention of vitamin C was found in the Direktor Johanssen variety. Storage tests carried out at 2°-3° C., 8°-10°, and 18°-20° showed best retention of vitamin C at a higher temperature. During storage sprouting occurred, and analysis showed an accumulation of ascorbic acid at the eyes, with the full-grown sprouts showing approximately twice as much ascorbic acid as the corresponding tubers (17.0 and 23.2 v 9.1 and 10.6 mg. percent).

A study of various parts of the potato (outer cortex, inner cortex, and pith) indicated in general that the inner cortex was richest in vitamin C in the raw potato. Upon cooking, however, the highest values, or greatest retentions, were obtained with the outer cortex. The pith averaged lower in both raw and cooked samples, but the results varied with the variety used. From his studies on the nitrogen content of the different layers of the potato and the ascorbic acid values found in these layers before and after boiling, the author has suggested that an ascorbic acid protein compound occurs in the potato, being most abundant in the outer layer and released during boiling.

Some antioxidant properties of d-iso ascorbic acid and its sodium salt, F. J. YOURGA, W. B. ESSELEN, JR., and C. R. FELLERS. (*Mass. Expt. Sta.*). (*Food Res.*, 9 (1944), No. 3, pp. 188-196).—In tests involving the use of aqueous solutions of *l*-ascorbic acid and *d*-isoascorbic acid and its sodium salt (sodium *d*-isoascorbate) it was found that the *d*-isoascorbic acid oxidized more rapidly than *l*-ascorbic acid, which in turn oxidized more rapidly than sodium *d*-isoascorbate during storage in a buffered aqueous solution. Bottled solutions of the ascorbic acids tested for relative rates of oxidation were observed for the degree of color development by the use of an Evelyn photoelectric colorimeter employing filter No. 400. All three of the solutions developed increasingly darker yellow-brown coloration as the oxidation progressed. The color development was less with *d*-isoascorbic acid than with *l*-ascorbic acid, and least with sodium *d*-isoascorbate. The amount of oxygen present, the temperature of storage, and the storage time were found to influence the development of color in the several solutions. Bioassay of the antiscorbutic activity of *d*-isoascorbic acid by the 25-day weight-response method of Dunker et al. (E. S. R., 89, p. 12) showed that this compound possessed only about one-twentieth of the antiscorbutic activity of *l*-ascorbic acid. Mixtures of solutions of *l*-ascorbic acid and *d*-isoascorbic acid bottled with a head space of 25 cc., pasteurized, and stored at 60° C. for 25 days were used in guinea pig bioassays to determine the amount of biologically active *l*-ascorbic acid present in these mixtures. The results of the bioassay indicated that *d*-isoascorbic acid had protected the *l*-ascorbic acid from oxidation. Similar tests in which sodium *d*-isoascorbate was substituted for *d*-isoascorbic acid showed that the salt did not afford protection of the *l*-ascorbic acid. Since the *d*-isoascorbic acid was preferentially oxidized in bottled aqueous solution, it appears that that compound would serve as an excellent antioxidant for *l*-ascorbic acid.

A study of plasma ascorbic acid values with relation to the type of diet used in Puerto Rico by groups of individuals of widely varied economic status, H. E. MUNSELL, A. M. CUADROS, and R. M. SUÁREZ (*Jour. Nutr.*, 28 (1944), No. 6, pp. 383-393).—The subjects of this study consisted of three groups having a satisfactory income and four groups having a low income or none at all. Dietary histories, collected by the interview method from all of the subjects, included records of foods eaten the day before the test, at breakfast on the day of the test, and types of fruits, vegetables, salads and other foods included in the diet. Blood samples were taken either in the postabsorptive state or after a breakfast containing no foods furnishing vitamin C.

The plasma ascorbic acid values were tabulated by income group in five ranges of concentration from 0.0 to 1.0 mg. percent or over. The highest percentage (47.8 percent) of the total number of subjects in the satisfactory income groups

was in the range 0.8 to 1.0 mg. percent or over, and in the unsatisfactory income groups (82.4 percent) in the range 0.0-0.49 mg. per 100 cc.; but 26.7 percent of the number in the satisfactory income groups had values in the lowest range and 6.3 percent of the number in the unsatisfactory income groups had values in the highest range. The types of food most definitely related to plasma ascorbic acid values were fruits and salads. For the range of 0.0-0.49 mg. per 100 cc., subjects in both satisfactory and unsatisfactory income groups had very little fresh fruit, while those in the range 0.8-0.99 mg. percent and above reported the regular use of citrus fruits in season and the frequent use of salads.

So far as known, none of the subjects had been diagnosed as having symptoms of scurvy. A check of all of the members of one of the low income groups for nutritional deficiency failed to reveal signs and symptoms of perifollicular hemorrhages, ecchymosis, or purpura, and only occasional signs of gingivitis. One of the subjects, who in the first examination had a plasma value of 0.10 mg. percent, was given daily supplements of 50 mg., and later 100 mg., of ascorbic acid. Frequent blood tests showed increasing ascorbic acid concentration to a high level of 1.37 mg. per 100 cc. When the supplement was stopped, the value dropped in about a month to 0.27 mg. To throw further light on the question of what, if any, level of ascorbic acid concentration in the blood should be taken as indicative of vitamin C deficiency, plasma ascorbic acid values were obtained for several species of animals. The highest value (0.56 mg. percent) was found in the guinea pig and the lowest (0.25 mg. percent) in the dog.

A discussion is included of the general dietary habits of the Puerto Ricans.

**Variation in the ascorbic acid requirements for saturation of nine normal young women, A. B. KLINE and M. S. EHEART.** (Va. A. and M. Col.). (*Jour. Nutr.*, 28 (1944), No. 6, pp. 413-419).—The authors review recent literature on the requirement of ascorbic acid for tissue saturation and present data obtained by a somewhat simplified modification of the commonly used method of responses in ascorbic acid excretion to the test dose. As summarized in the report, daily urinalyses "for ascorbic acid were omitted and only the 24-hr. samples of urine before and after the test dose were analyzed. A more liberal intake of ad libitum foods was allowed, and the subjects as far as possible lived and ate under their normal dormitory conditions." Under these conditions, six of the nine subjects were found to have ascorbic acid requirement for saturation above 1.4 mg. per kilogram, but not greater than 1.8 mg. The requirement of one of the subjects was 0.6 mg. or less per kilogram, and of the other two 2.2 mg. or above per kilogram.

**The relation of the blood level of ascorbic acid to the tissue concentrations of this vitamin and to the histology of the incisor teeth in the guinea pig, C. A. KUETHER, I. R. TELFORD, and J. H. ROE** (*Jour. Nutr.*, 28 (1944), No. 5, pp. 347-358, illus. 5).—The 66 guinea pigs used in the study were maintained for a preliminary period of 10 days on a commercial rabbit chow with cabbage ad libitum to bring their stores of vitamin C to the same level and were then transferred to a basal diet containing 28 mg. of ascorbic acid per kilogram supplemented in various groups by 0, 50, 100, 150, 200, 300, 400, and 600 mg. of the vitamin per kilogram of diet. A control group was given approximately 50 gm. of cabbage daily. The animals were sacrificed after from 26 to 38 days, except for one group kept for 73 days on the diet. Whole blood and various tissues were analyzed for ascorbic acid by the method of Roe and Kuether (E. S. R., 90, p. 297). The carcasses were examined for evidence of ascorbic acid deficiency, and longitudinal sections of incisor teeth were examined histologically.

From the lowest to the highest intake of ascorbic acid the concentration in whole blood increased about 6 times, with increases in the other tissues of brain 6, muscle 11, kidney 14, spleen 15, heart and liver 19, and the adrenals 24 times. In every tissue examined, the ratio of tissue concentration to whole blood concentration

reached a maximum at or near a whole blood concentration of 0.25 mg. percent. To maintain this concentration, an ascorbic acid intake of approximately 1.23 mg. per 100 gm. body weight was necessary. In man, this would be the equivalent of 861 mg. per day on a body weight basis, or 196 mg. per day on a surface area basis. Although these data indicate that the vitamin C requirement of the guinea pig is much higher than that of man, the definite relations shown between the concentration of ascorbic acid in the tissues and that in the blood suggest that the determination of ascorbic acid content of the whole blood is the best procedure for evaluating the nutritional status of an animal with respect to vitamin C.

In the incisor teeth, the most obvious pathological changes resulting from ascorbic acid deficiency were found to be in the odontoblastic areas. Alterations in calcification patterns occurred at about the same level as changes in the odontoblastic layer but were not as consistent or as easily interpreted. At a whole blood ascorbic acid level above 0.22 mg. per 100 cc., no pathological lesions were evident. It is thought that conventional methods of determining the presence of scurvy are too inadequate and insensitive to be of any value in detecting a mild ascorbic acid deficiency in the guinea pig.

The bioassay of vitamin E, G. A. EMERSON and H. M. EVANS. (Univ. Calif.). (*Jour. Nutr.*, 27 (1944), No. 6, pp. 469-476, illus. 1).—In attempts to improve the sensitivity of vitamin E bioassay, both virgin and resorption gestation rats were used and the test materials were administered in single or multiple doses. Two types of diets were fed, in the first of which vitamin E was destroyed by the incipient rancidity of the lard, which constituted 22 percent of the ration, and in the second, which contained no lard, it was removed by extractions of the potential vitamin E-containing ingredients with fat solvents. Four adaptations of the second type diet were used, differing in the supplements of fat-soluble and water-soluble vitamins and source of linoleic acid. In two, the vitamins were furnished by carotene, calciferol, and ether-extracted brewer's yeast; in the third by carotene, calciferol, and brewer's yeast; and in the fourth by cod-liver oil and brewer's yeast. The first diet was also supplemented with ethyl linoleate and the other three with its equivalent in peanut oil.

During the period of early growth, the rats on the high fat diet grew more rapidly than those on the low fat diets, but after several months the differences were not apparent. Those receiving unextracted brewer's yeast reached a somewhat higher final weight than those on extracted yeast. Peanut oil proved as satisfactory as ethyl linoleate. The young of the mothers on the low fat diet were of somewhat better quality than those on the high fat diet. The highest incidence of first litter fertility occurred in the animal on the high fat diet, but those raised on the low fat diet proved more sensitive for test animals on vitamin E assay. Virgin and resorption gestation rats served equally well as test animals. Multiple rather than single dosage of  $\alpha$ -tocopherol resulted in a higher percentage of litters. The minimal effective dose of  $\alpha$ -tocopherol acetate to insure fertility in rats on the high fat diet was between 1.8 and 2.7 mg.

Vitamin K content of dairy and cacao products, W. S. MUELLER and A. W. WERTZ. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 2, pp. 167-168).—Day-old chicks fed Ansbacher's K<sub>7</sub> diet (E. S. R., 85, p. 714) until depleted of vitamin K were divided into groups of eight, and each group was fed some one of the test substances. Of the various dairy and cacao products fed, only cultured buttermilk and cacao shell had any effect on blood-clotting time. Neither the unprocessed nor the Dutch-processed cocoa powder shortened the time for coagulation. These results indicate that the previously observed decrease in blood-clotting time in rats receiving cocoa was not caused by any vitamin K in the cocoa.

The avitaminoses, W. H. EDDY and G. DALLDORF (Baltimore: Williams & Wilkins Co., 1944, 3. ed., pp. 438+, illus. 93).—The present edition has been written

with the same purpose as previous editions (E. S. R., 77, p. 891; 86, p. 567), but has been rearranged to sharpen the separation between the deficiency diseases and the chemical nature and functions of the vitamins. The material has been brought up to date, and the chapters pertaining to the chemistry of the vitamins and cellular oxidation have been rewritten and supplemented with many new illustrations.

## HOME MANAGEMENT AND EQUIPMENT

**Kerosene burners in a wood cookstove, M. M. MONROE** (*Maine Sta. Bul. 433* (1945), p. 273-285+, illus. 6).—This bulletin is concerned principally with the installation, management, and maintenance of range oil burners for kerosene; operations for which full and explanatory directions are given, with drawings to facilitate the correct adaptation of the burner to the structure and draft characteristics of the stove.

Some experimental work is also reported upon, notably that showing a cooling of both oven and stove-top lids by opening the pipe, ashpit, or oven dampers. Opening the last-named damper lowered top temperatures by from 65° to 80° F. in addition to lowering the oven temperature by from 100° to 150°. In a stove having no dampers to control the air intake at the ashpit and but very little resistance to the flow of air around the oven, sand added to the flue passage under the oven to restrict the free space for flowing air to 1 $\frac{3}{4}$  in. caused the oven temperatures to increase 75° and top-stove over 100°. Adding sand under the oven of a stove having an ashpit damper which was kept half closed and a much longer air passage between burners and pipe had little effect, however.

Instructions for efficient use of the top stove, approximations of fuel consumption, and brief discussions of the cause and effect of air on the feed pipe and of the cleaning of the burners are also included.

## REPORTS AND PROCEEDINGS

**Agricultural research serves farmers, ranchers, and industry: Fifty-fifth and Fifty-sixth Annual Reports, 1942-43, A. B. CONNER ET AL.** (Partly coop. U. S. D. A. et al.). (*Texas Sta. Rpt. 1942-43*, pp. 45).—Brief statements are given on findings, including waxy kafir as a source of tapioca flour; types of grain sorghum and rice for combine use; fertilizers for rice and potatoes; pollinizers for the Bruce plum; increasing the acre yield of grapes; breeding citrus for hardiness to cold; improved citrus rootstocks; new hybrid dewberries; new method of growing papayas; phosphates for pastures and ranges; wintering stocker beef calves; losses of B vitamins in roasting beef; core sampling of wools for shrinkage determination; shrinkage of mohair; beef cattle production on pastures; culling sheep for increased wool production; breeding sheep and goats resistant to stomach worms; calcium supplement and oat grazing for milk cows; cytological studies with sheep and goats and with cotton; rations for developing registered bull calves; prevention of urinary calculi in cattle; improved devil's shoestring as a source for rotenone; observations on the cattle grub in feeder steers; supplying phosphorus supplements to range cattle; protein requirements for fryers and pullets; utilization of soil phosphoric acid; carotene in pasture and range grasses and roughage feeds; utilization of carotene in vegetables; carotene as formerly determined is a mixture of carotenes; vitamin A potency of butter; new method of measuring fineness of cotton fibers; turnip greens at successive stages of growth; oats and hegari v. corn for laying hens; closed level terraces to prevent run-off and erosion; control of turkey lice; growing turkeys in confinement; balanced Broad-Breasted turkeys; *Schoenocaulon drummondii*, a new source of a potent insecticide; corn hybrids and

varieties; adapting Texas cotton to war needs; wild turkey research; new flax varieties resistant to rust; disease resistant blackeye peas; storing sorghum grain in trench silos; *Urginea maritima*, a source for red squill; starter solution increases yield in tomatoes; development of new pasture grasses; effect of light, soil moisture, and nitrogen on cotton fruiting; trials with rubber plants; larger sized summer tomatoes produced by breeding; placement of fertilizer; potato yields increased by prolonging growth of plants; new varieties of rice, broccoli, and wheat; large yellow tomatoes for east Texas; blackeye pea No. 8152 resistant to root-knot; effect of tillage and fertilizers on root rot; soil acidity and growth of rose cuttings; peach adaptability tests; cotton breeding, varieties, fertilizers, and root rot; relation of soil micro-organisms to severity of root rot of cotton; large-fruited red tomatoes immune to fusarium wilt; green pasture saves protein supplements in swine rations: sunn, jute, and kenaf as fiber crops in Texas; requirements for brood sows and fattening pigs for vitamin A; sulfur and other fungicides for control of peanut diseases; effect of Hubam clover on root rot and yield of cotton; soybeans under irrigation in west Texas; effect of plowing under legumes on yields of cotton and corn; Emerald, a new variety of sweetclover; maintaining color of roses; dried rose buds for medicinal purposes; essential oils from horsemint (*Monardia fistulosa*), cherry-laurel (*Prunus laurocerasus*), goldenrod (*Solidago adora*), and mintweed (*Pucranthemum incanum*); control methods for cotton insects; new selection of Porto Rico sweetpotato; sweet sudan, a new grazing crop; Early Grano onion for the Winter Haven area; rust resistant small grains; harvesting cotton with a roller-type stripper; mesquite eradication; machine harvesting of corn; a farm slicer for sweetpotatoes; and Gulf coast prairie vegetation deficient in phosphoric acid.

[Farmer's guide to agricultural research in 1943] (*Jour. Roy. Agr. Soc. England*, 105 (1944), pp. 1-69).—This review of British findings of the year is presented under the following titles: Crops and Plant Breeding, by G. D. H. Bell (pp. 1-12) Diseases of Animals—Prevention and Treatment, by T. Dalling (pp. 13-24); Farm Economics, by C. S. Orwin (pp. 25-29); Dairy Farming and Dairy Work, by J. Mackintosh (pp. 30-38); The Feeding of Livestock, by W. Godden (pp. 39-46); Soils and Fertilizers, by E. J. Russell (pp. 47-57); and Farm Implements and Machinery, by S. J. Wright (pp. 58-69).

## MISCELLANEOUS

Vital research of agriculture, J. H. MACGILLIVRAY, G. C. HANNA, J. E. KNOTT, and T. E. WEIER. (Univ. Calif.). (*Science*, 101 (1945), No. 2615, pp. 143-144).—According to the authors, experimental study of plants and animals for the purpose of feeding, clothing, and sheltering the human race should be called "vital research," and such research is the purpose of the Hatch act. The war suddenly focused attention on these objectives, and "for the first time in many years, workers in other sciences were striving with agricultural personnel towards a common goal." In their opinion, "the constructive gains made through this cooperation must be preserved."

Some applications of the logarithmic series and the index of diversity to ecological problems, C. B. WILLIAMS (*Jour. Ecol.*, 32 (1944), No. 1, pp. 1-44, illus. 25).—This paper describes the application of a logarithmic series to a number of problems of species, area, and numbers of individuals in the plant and animal kingdoms; problems connected with the grouping of species into genera; and the index of diversity in different families and its use as a comparison of different populations. The logarithmic series was found to fit extremely well to a number of frequency series drawn from insects, birds, butterflies, and plants, except that there was a slight tendency for the calculated  $n_1$  (number of groups with one unit) to be below the observed. It also fitted well—sometimes extremely well—to the

number of genera with different numbers of species in standard classifications of groups of both animals and plants. The conception of the index of diversity was applied to problems of the number of species of plants on different areas and to the comparison of floras of different areas, with interesting results. A classification is given of 171 families of dicotyledons according to their index of diversity to stimulate discussion as to which may be the factors that bring about differences and resemblances in this index. In general, the families with large numbers of species and genera have a large index of diversity, but there may be a very great range of index in families of approximately the same size. There are 25 references.

**The naturalist's lexicon**, R. S. Woons (*Pasadena, Calif.: Abbey Garden Press, 1944, pp. 282+*).—This is a list of classical Greek and Latin words used or suitable for use in biological nomenclature. A condensed and classified English-classical supplement is appended.

**Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations, 1944-45**, B. T. RICHARDSON (*U. S. Dept. Agr., Misc. Pub. 556 (1945), pp. 164+*).—This is the usual annual list (E. S. R., 91, p. 237) of the workers in agriculture and home economics in the land-grant colleges and experiment stations, the personnel of the Office of Experiment Stations, and the officers and standing and special committees of the Association of Land-Grant Colleges and Universities.

**Mississippi Farm Research [March 1945]** (*Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 1, pp. 8, illus. 14*).—In addition to articles noted elsewhere in this issue and meteorological notes, this number contains Kudzu in the Ration for Growing Chicks, by H. D. Polk and M. Gieger (pp. 3-4, 5), also to be issued as a bulletin; February Price Report, by D. G. Miley (pp. 1, 8); and To Prevent Swarming, by C. Lyle (p. 8).

**Research and Farming [January 1945]** (*Res. and Farming [North Carolina Sta.], 3 (1945), Prog. Rpt. 2, pp. 12, illus. 11*).—In addition to articles noted elsewhere in this issue, this number contains Turkey Paratyphoid, by H. C. Gauger and R. E. Greaves (pp. 2, 11); The Agricultural Engineering Department, (p. 8); and The Farm Income Situation, by G. W. Forster (p. 11).

**Publications available from the [Kansas] Agricultural Experiment Station (Kansas Sta. Cir. 237 (1945), pp. [4])**.—An extension to January 1945 of the list previously noted (E. S. R., 91, p. 237).

**Supplement to the "Survey of current bibliographies on agriculture and allied subjects" (1937)**, S. VON FRAUENDORFER (*Internat. Rev. Agr. [Roma], 23 (1942, No. 11, pp. 387T-408T)*).—This is a supplement to this survey (E. S. R., 78, p. 142), including some omissions and recent additions. The total number of titles is about 100, from about 20 countries.

## NOTES

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**Rhode Island College and Station.**—Dr. Basil E. Gilbert, vice director of the station and acting head of the department of agronomy, died June 27 at the age of 53 years. A native of Canada, where he obtained his early education, he received the Ph. D. degree from the University of Chicago in 1925, and soon afterward joined the station staff as chemist. In 1928 he also became director, and in 1933 was made vice dean and director of research and head of the department of biology and chemistry. His research had been largely in the field of biochemistry, including phytochemistry, the interrelation of photoperiodism and temperature, and the optimum nutrient requirements of field crops.

**West Virginia University and Station.**—Dr. Leon H. Leonian, professor of mycology and mycologist since 1936, died June 7 aged 57 years. A native of Armenia, he came to the United States in 1908, graduated from the University of Kentucky in 1916, and received from the University of Michigan the M. S. degree in 1917 and the Ph. D. degree in 1922. He served as assistant research horticulturist in the South Carolina Station in 1917-18 and as assistant professor of botany and plant pathologist in the New Mexico College and Station for the following 4 years, coming to West Virginia in 1922. His early work centered around the control of plant pathogens, particularly downy mildew, fusarium wilt, and the wilt of peppers. Work on the taxonomy of the genus *Phytophthora* increased his interest in physiological studies, such as the influence of growth and sexuality factors for fungi and growth for bacteria. As an avocation he achieved much proficiency in the growing and improvement of delphiniums and other flowering plants, and for many years was editor of the Delphinium Yearbook.

**Office of Experiment Stations.**—B. C. Reynolds, associate agricultural engineer in the Puerto Rico Federal Station, has been appointed an experiment station administrator in agricultural engineering.

**Necrology.**—Dr. Charles W. Dabney, one of the few remaining pre-Hatch workers and administrators in experiment station research, died June 15 at the age of 90 years. From 1880 to 1887 he served as chemist and as the second director of the North Carolina Station, and from 1887 to 1890 as professor of agriculture and director of the Tennessee Station. He was also president of the University of Tennessee from 1887 to 1904, receiving leave of absence in 1893 to serve for 4 years as Assistant Secretary of Agriculture. In 1904 he became president of the University of Cincinnati, from which position he retired in 1920.

Dr. Dabney was a widely known and influential figure in the pioneer days of agricultural research. As Assistant Secretary of Agriculture he rendered a timely and constructive service of unique value. It is believed that he was the last survivor of both the meeting of experiment station workers in 1885 and the first convention of the Association of Land-Grant Colleges and Universities in 1887. He was also one of the founders of the Association of Official Agricultural Chemists, serving as its first secretary-treasurer in 1884-85.

**Association Meetings.**—The fifty-ninth convention of the Association of Land-Grant Colleges and Universities will be held in Chicago on October 24-25. Because of transportation restrictions the only sessions will be those of the Executive Body.

The 1945 annual meetings of the Association of Official Agricultural Chemists, Inc., and the Association of American Feed Control Officials, Inc., will not be held.

# EXPERIMENT STATION RECORD

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## RECENT WORK IN AGRICULTURAL SCIENCE<sup>1</sup>

### AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A simple and inexpensive voltage regulator for laboratory use, R. H. WALLACE. (Univ. Conn.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 295-300, illus. 4).—Variations in voltage are frequently a source of trouble in experimental work, resulting in unreliable data, injury to equipment, or shortened life of electrical devices. The voltage regulator described and illustrated was in use for several months by the author with excellent service, proving of particular value as a voltage source for recording potentiometers. It was also used in a series of tests with ultraviolet output from lamps which made it immediately obvious that the output was highly unreliable without it. Its most interesting general use was to control the entire voltage supply to the laboratory so that all motors, water baths, and incubators were on uniform voltage. "Full-sized blueprints with detailed instructions and list of parts are available from the author."

Microviscometer, E. R. WEYER (*Science*, 101 (1945), No. 2629, pp. 521-522, illus. 1).—"Usual methods for viscosity determination require specimens of considerable volume. In dealing with small samples, e. g., biological fluids, the simple device described permits rapid, accurate determinations on volumes of less than 0.1 [cc.]".

The use of monochloracetic acid to include ammonia in the chlorate method for total nitrogen in plant tissue, E. M. EMMERT. (Ky. Expt Sta.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 307-309.)—The method for determining total N in plant tissue previously described (E. S. R., 85, p. 5) is made to include NH<sub>3</sub> and also made more rapid and accurate by use of monochloracetic acid. In the presence of strong alkali, NH<sub>3</sub> and monochloracetic acid react to form glycine which is readily oxidized by the chlorate treatment, the N passing to HNO<sub>3</sub>. The only pieces of apparatus needed are 30-cc. test tubes, small pipettes and graduates, and a container for boiling water. The results here reported from use of this test are believed to warrant further trial.

The colorimetric estimation of small amounts of ammonia by the phenol-hypochlorite reaction, J. A. RUSSELL (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 457-461, illus. 1).—The conditions for maximum color development in the reaction of ammonia with phenol and hypochlorite were investigated, and the sensitivity

<sup>1</sup> The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

of this test for ammonia was considerably increased. A simple and reliable colorimetric procedure for estimating very small amounts of ammonia nitrogen is described and is considered suitable for use with micro diffusion or other distillation or aeration procedures.

A rapid laboratory method for the detection of manganese in fresh plant tissue, R. L. COOK and K. LAWTON. (*Mich. Expt. Sta. Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 327-328).—Place a 20- to 50-cc. volume of fresh leaf material (finely chopped) in a 300-cc. flask. Add 85 cc. of 1-33 acetic acid. Stopper the flask and shake vigorously for 1 min. Filter, place 25 cc. of the filtrate in a 150-cc. flask, and add 0.2 gm. of solid potassium periodate, 10 cc. concentrated nitric acid, and 0.5 cc. 85-percent phosphoric acid. Heat the solution to boiling and boil 30 sec. The color, ranging from colorless to strong orange, develops on cooling. Compare the color with standards developed for each crop.

Microdetermination of potassium by precipitation and titration of the phospho-12-tungstate, D. D. VAN SLYKE and W. K. RIEBEN (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 743-763, illus. 1).—Potassium in the redissolved ash of serum, blood, urine, tissues, or feces is precipitated as the salt,  $K_5H(PO_4 \cdot 12WO_4)_2 \cdot 6H_2O$ , of phospho-12-tungstic acid. The precipitate is washed with water by centrifugation, and is titrated with sodium hydroxide to form  $Na_2WO_4$  and  $Na_2HPO_4$ . 9.4 equivalents of NaOH being used for each equivalent of potassium. The high alkali equivalent adapts the procedure to microdeterminations, from 1 to 0.2 cc. of serum serving for a determination.

Gravimetric determination of potassium as phospho-12-tungstate, W. K. RIEBEN and D. D. VAN SLYKE (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 765-776).—Potassium is precipitated with phospho-12-tungstic acid, and the precipitate is dried at 100° [C.], and weighed as  $K_5H(PO_4 \cdot 12WO_4)_2 \cdot 6H_2O$ . Washing, drying, and weighing are done in the same centrifuge tube, without transfer. The solubility of the precipitate in water at room temperature is 1.16 mg. per 100 cc., equivalent to 0.038 mg. of potassium per 100 cc. The low solubility and high equivalent weight of the precipitate adapt it to gravimetric microanalysis, 1 mg. of potassium yielding 30.1 mg. of precipitate. From 1 to 3 cc. of serum provides a sample for the analysis, weighing of the precipitate being performed on a semimicro balance.

Determination of *L*-lysine with a specific decarboxylase, C. A. ZITTLE and N. R. ELDRED (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 401-409, illus. 2).—A simple preparation of *L*-lysine decarboxylase and its convenient application to the rapid determination of *L*-lysine are described. The decarboxylase preparation used consisted of the acetone-dried cells of a strain of *Bacterium cadaveris*, grown on a medium of which the preparation is detailed and separated from this liquid medium by means of a Sharples centrifuge. The quantity actually measured is that of the  $CO_2$  evolved under specified conditions. The lysine contents of casein, gliadin, zein, human and horse globin, and soybean flour obtained by this method are reported. The data are compared with those in the literature.

The tryptophane content of feedstuff proteins, F. H. KRATZER. (Univ. Calif.). (*Jour. Biol. Chem.*, 156 (1944), No. 2, 507-509).—The tryptophan content of various feedstuff proteins was determined by Eckert's method (E. S. R., 90, p. 297) after hydrolysis of the feedstuff in the autoclave by barium hydroxide. Substances thus examined included casein, alfalfa meal, wheat, wheat bran, barley, yellow corn, corn gluten and hempseed meals, soybean oil meal, cotonseed meal, linseed meal, sesame meal, peanut meal, yeast, dried buttermilk, sardine and tuna meals, menhaden stick, meat scrap, liver meal, blood meal, red cell-blood fraction, and beef fibrin.

thiochrome assay of urine two nicotinamide derivatives, in particular the methochloride  $F_2$  and its oxidized form  $F_3$ , produce fluorescence which interferes with the reaction.  $F_2$  produces a white fluorescence with isobutanol and alkali and a deep blue fluorescence when ferricyanide is included. By assaying known amounts of the methochloride, converting them to the  $F_3$  form, and calculating the blue fluorescence produced in terms of "thiamine equivalent" when compared to thiamine standards prepared for the thiochrome determination, the author has attempted to overcome this source of error.

Following the usual thiochrome procedure of Hennessy and Cerecedo (E. S. R., 82, p. 588), urine samples are eluted from the "Decalso" adsorbent, one-half the eluate is treated with ferricyanide, alkali, and isobutanol, and the fluorescence (which contains  $F_3$  and thiamine) is compared to thiamine standards similarly treated. Alkali and isobutanol alone are added to the other half, and the fluorescence produced is compared to  $F_2$  standards made from pure nicotinamide methochloride. The fluorescence due to  $F_2$  is computed from the methochloride assay and subtracted from the total blue fluorescence due to  $F_3$  and thiochrome. By observing certain precautions, it has been possible to estimate thiamine by this method with an error of less than  $\pm 10$  percent.

A colorimetric method for the micro-determination of 2,2 bis(p-chlorophenyl) 1,1,1 trichlorethane (DDT), H. A. STIFF, Jr., and J. C. CASTILLO (*Science*, 101 (1945), No. 2626, pp. 440-443, illus. 1).—The test is based on the discovery that when DDT is heated in an anhydrous pyridine solution containing xanthidrol and solid KOH a red color develops which under proper conditions is proportional to the amount of DDT present. The reaction is sensitive to as little as 10 $\gamma$  of DDT and will detect small differences in concentration within 10 $\gamma$ -200 $\gamma$ . The test is relatively simple and can be run in a comparatively short time.

Penicillin.—III, The stability of penicillin in aqueous solution, R. G. BENEDICT, W. H. SCHMIDT, R. D. COGHILL, and A. P. OLESON. (U. S. D. A.). (*Jour. Bact.*, 49 (1945), No. 1, pp. 85-95, illus. 10).—In this installment (E. S. R., 92, p. 770), a series of graphs is presented to show the stability of a crystalline sodium salt of penicillin in aqueous solution at pH 2-11 and various temperatures. When compared with a solution of the crystalline salt at pH 2 at 0° C., a partially purified solution of penicillin under the same conditions was found to be less stable. It appears that the destruction of penicillin in aqueous solution is a first-order irreversible reaction. The time required to destroy a solution of crystalline penicillin at pH 2 and temperatures between -10° and +40°, and the rate of destruction at any chosen point during that time, may be calculated by using formulas derived from the data here presented.

Tests for quality in egg pulp.—II, Further experiments on the resazurin reductase test, W. J. SCOTT and J. M. GILLESPIE (*Jour. Council Sci. and Indus. Res. [Austral.]*, 17 (1944), No. 4, pp. 299-304, illus. 2).—Further tests (E. S. R., 89, p. 513) are described on the application of the resazurin reductase test to the quality grading of egg pulp. The reduction time and bacterial plate count are given for pulp prepared in Victoria, New South Wales, Queensland, and South Australia. Regression equations show no appreciable differences in magnitude between the equations for the various States of Australia. Different temperatures for conducting the tests were also investigated.

Routine examination of milk for added water, H. C. LYTHGOE (*Jour. Milk Technol.*, 8 (1945), No. 2, pp. 101-107, illus. 3).—The freezing point of milk served best to indicate the addition of water, but when making close decisions samples of known purity seemed desirable.

The determination of moisture in undisturbed soil, N. E. EDLEFSEN and W. O. SMITH. (Univ. Calif. and U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 112-115).—The authors discuss the theoretical bases of the various proposed

methods, the measurements being divided into (1) those correlated with moisture content, and (2) those correlated with free energy. In class (1) are the methods involving measurement of the electrical conductivity, the dielectric constant, or heat conductivity. In class (2) are placed similar measurements upon porous blocks in contact with the soil, together with tensiometer methods and the more recently devised pressure-plate method. Both advantages and shortcomings of these methods are considered, and the mathematical bases for evaluating free energy relations are outlined.

**Soil reaction:** Glass electrode and colorimetric methods for determining pH values of soils, J. F. REED and R. W. CUMMINGS. (N. C. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 1, pp. 97-104).—Electrometric and colorimetric methods are discussed, as are also such factors affecting the pH of the soil as effect of dilution (soil : water ratio), effect of stirring and aspiration, effect of carbon dioxide, periodic variation, effect of drying and grinding, and miscellaneous effects. Of the two methods suggested, one places the glass electrode in contact with soil wetted to a water content slightly above the moisture equivalent, the other being an aeration method applied to a 1 + 1 suspension of the soil and distilled water.

**Determination of soil organic matter,** C. J. SCHOLLENBERGER. (Ohio Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 1, pp. 53-56).—The author made an experimental comparison of a modification, here detailed, of his own method (E. S. R., 65, p. 504) with the method of Walkley and Black (E. S. R., 70, p. 742), and a modification of the last-named procedure in which the quantity of concentrated sulfuric acid used is halved and heating at 140° C. (thermometer in the reaction mixture) for 5 min. is substituted for the use of the heat of dilution of the larger quantity of sulfuric acid. The recovery was highest and the standard digestion was lowest when the first of these three procedures was followed, and this method is therefore recommended, "but if less care has been taken in obtaining or preparing a sample, a simpler method such as the Walkley-Black may serve equally well, with proper allowance for the lower recovery ratio—that is to say, the value of the titrating solution should be established by a determination on a similar soil of known organic carbon content. As the reduction of chromic acid involves a pronounced change in color, orange to green, rapid measurements by colorimetric or photoelectric means may be substituted for titration."

**Determination of exchange capacity and exchangeable bases in soil: Ammonium acetate method,** C. J. SCHOLLENBERGER and R. H. SIMON. (Ohio Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 1, pp. 13-24, illus. 3).—The authors briefly present reasons for considering ammonium acetate the most suitable salt to be used for displacement of the exchangeable bases and for the selection of pH 7 as the neutral or reference point. They then proceed to discuss preparation of sample, apparatus, preparation of the ammonium acetate extract, determination of exchange capacity, and examination of the ammonium acetate extract, giving full manipulative directions for the operations named.

**Determination of exchangeable cations and exchange capacity of soils: Rapid micromethods utilizing centrifuge and spectrophotometer,** M. PEECH. ([N. Y.] Cornell Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 1, pp. 25-38, illus. 1).—The exchangeable cations are extracted with N ammonium acetate solution. After the excess of ammonium acetate is washed out with 95-percent ethyl alcohol, the adsorbed ammonium, which affords a measure of the exchange capacity, is extracted with 10-percent sodium chloride solution and determined colorimetrically by direct nesslerization. The ammonium acetate extract containing the exchangeable cations is evaporated to dryness; the organic matter and the ammonium salts are destroyed by digestion with nitric and hydrochloric acids, followed by ignition at 390° C. After evaporation with hydrochloric acid, the residue is dissolved in 0.1 N nitric acid. The exchangeable cations are then determined directly in separate aliquots, all of the separations being carried out in a 15-cc. centrifuge tube. Calcium is determined

volumetrically as the oxalate; magnesium, potassium, sodium, and manganese are determined colorimetrically, utilizing a spectrophotometer.

Photometric interpretation of X-ray diffraction patterns for quantitative estimation of minerals in clays, N. N. HELLMAN and M. L. JACKSON. (Wis. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp 135-143, illus. 5).—X-ray diffraction line densities were measured by means of a specially devised microphotometer having an extremely bright light source of adjustable intensity to permit the accurate measurement of high film density. Sufficient X-ray diffraction exposure time to give high film densities could be employed and the maximum contrast between diffraction lines of various minerals obtained. The relative error in line density measurement was reduced and the sensitivity of the analysis increased.

It is shown, on a theoretical basis, that the intensity of the radiation diffracted to form a line is in simple proportion to the concentration of a mineral in a mixture. For film densities below a value characteristic of the film, and called the critical value, the line density is proportional to the quantity of incident X-radiation. Hence, concentration of a given mineral in the test sample can be evaluated for lines of low density by calculating the ratio of the microphotometrically measured line density in the pattern of the test sample to the density of the corresponding line in the pattern of the pure material. Film density above the critical film density is not in simple proportion to the quantity of incident radiation, but it was found that when film density ceases to be proportional simply to the quantity of incident X-radiation it becomes proportional to the logarithm of the quantity of incident X-radiation. A method for computing the observed line density over to a "corrected density" which is proportional to incident X-radiation, and in turn to mineral concentration, was based on the derived constants of the X-ray film-blackening curves.

In the analysis of kaolinite-muscovite synthetic mixtures and a montmorillonite-hydrous mica synthetic mixture, good agreement was obtained between the quantities found and those added.

Determination of total nitrogen, ammonia, nitrates, and nitrites in soils, A. L. PRINCE. (N. J. Expt. Stas.). (*Soil Sci.*, 59 (1945), No. 1, pp. 47-52).—Following a brief discussion of the merits and draw-backs of a number of digestion catalysts, the author prescribes for the determination of total nitrogen in soils a Kjeldahl method calling for a 10-gm. sample, a mercury or mercuric oxide catalyst, sodium sulfate to raise the boiling point of the acid, and a digestion period of from 1.5 to 2 hr. For ammonia, an aeration method requiring a special apparatus is considered to be too long and tedious; and a method using sodium chloride for displacing exchangeable ammonia, followed by distillation with magnesium oxide to drive off the ammonia into 0.02 N hydrochloric acid and titration of the excess acid with 0.02 N sodium hydroxide is given. For nitrate determination, the phenol disulfonic acid method is detailed; and for nitrites, although the author holds it doubtful whether an accurate determination of nitrites in a soil can be made, even if they occur in measurable quantities, the standard sulfanilic acid method is recommended and a procedure is described.

Determination of carbonates in soil, C. J. SCHOLLENBERGER. (Ohio Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 1, pp. 57-63, illus. 1).—Carbon dioxide is liberated in vacuo at a comparatively low acid concentration and low temperature and in the presence of an effective reducing agent. These factors decrease the tendency for carbon dioxide to evolve from soil organic matter, in part from decarboxylation reactions as well as by an oxidation induced by reactions between the added acid and manganese dioxide native to the soil. Absorption of the gas in a measured excess of standard barium hydroxide solution is practically concurrent with its evolution in the closed system, minimizing opportunity for losses. The absorption is quantitative, and with normal soils there is no error from absorption of any other acid. A simple titration of the barium hydroxide not precipitated as barium car-

bonate is an accurate index of carbonates in the sample. To avoid the occasional loss of determinations by pumping or frothing, which may throw some of the material over into the absorption flask, the author recommends the substitution of a condenser tube with eight oval bulbs for the straight tube.

**Determination of soluble salts in soils,** O. C. MAGISTAD, R. F. REITEMEIER, and L. V. WILCOX. (U. S. D. A. et al.). (*Soil Sci.*, 59 (1945), No. 1, pp. 65-75, illus. 1).—The authors discuss the moisture percentage with reference to its effect on concentration and total quantity of salts in the soil solution; methods of obtaining a soil solution (displacement, pressure-membrane method, and water extraction); determination in the solution of its total salts content (by evaporation and weighing or by electrical conductivity measurement); and determination by concentrate methods of the various cations and anions. Specific directions for these determinations are given.

**Determination of total copper, zinc, cobalt, and lead in soils and soil solutions,** R. S. HOLMES. (U. S. D. A.). (*Soil Sci.*, 59 (1945), No. 1, pp. 77-84, illus. 2).—A diphenylthiocarbazone extraction method leading to colorimetric determinations of all four of these metals is described, the entire process being outlined in a flow sheet diagram, and numerous precautionary details are fully dealt with in complete working instructions. A 2-gm. sample of the soil is digested with 60-percent perchloric acid; the solution is evaporated nearly to dryness; and the residue is taken up in N hydrochloric acid, boiled under reflux, filtered, and made up to 100 cc., of which a 25-cc. aliquot provides material for the determinations of copper and zinc while a second aliquot of 50 cc. is used in the determination of the cobalt and the lead.

**Determination of total selenium and arsenic in soils,** W. O. ROBINSON. (U. S. D. A.). (*Soil Sci.*, 59 (1945), No. 1, pp. 93-95, illus. 1).—The methods described are both dependent on volatility of the bromides formed when the sample is distilled with concentrated hydrobromic acid in the presence of free bromine. By redistilling the distillate, reinforced with added hydrobromic acid and bromine, with successive 100-grn. samples of the soil, the selenium can be detected with security in concentrations as low as 1 part in 10 billion of soil.

The final determination is made by reducing excess bromine with sulfur dioxide and precipitating the selenium as the red colloidal form of the free element, by means of hydroxyl amine hydrochloride, in the presence of gum acacia used as protective colloid. Arsenic is determined by an ammonium molybdate method, for which the filtrate from the selenium determination may be used. If a separate soil sample is used, 10 gm. of the soil will be sufficient. The detailed procedure of both methods is given.

**Determination of vanadium and molybdenum in soils,** W. O. ROBINSON. (U. S. D. A.). (*Soil Sci.*, 59 (1945), No. 1, pp. 91-92).—In a sodium carbonate fusion, vanadium is determined in an aliquot of the neutralized solution of the melt by extraction with 8-hydroxyquinoline and chloroform, evaporation of the solvent from the extracted complex, ignition with a small quantity of sodium carbonate, and colorimetric determination by a phosphotungstate method. Molybdenum is determined as the thiocyanate formed by reducing the sample solution and standard with stannous chloride solution, in the presence of potassium thiocyanate, in an ether-extract solution. Technical detail of each method is given in full.

**The fusion analysis of soils: Determination of Si, Ti, Al, Fe, Mn, Ca, Mg, K, Na, and S,** W. O. ROBINSON. (U. S. D. A.). (*Soil Sci.*, 59 (1945), No. 1, pp. 7-11).—In addition to the detailed directions for the fusions, the solution of the melt, and the separation and determination of the elements named, the author prescribes also methods for the preparation of the sample, the determination of its moisture content as of the time of the weighing out of the samples for the mineral element determinations, and the loss on ignition. A fusion with sodium carbonate

alone is used in preparation for the determination of the metallic elements and silica, and a separate fusion with sodium carbonate and a small quantity of sodium nitrate for the determination of sulfur. Calculation of the results as the oxides rather than as the elements themselves is recommended, on the ground that the summation of the percentages calculated as oxides should closely approach 100.

**Determination of total and available boron in soils, E. TRUOG.** (Wis. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 1, pp. 85-90, illus. 1).—A quinalizarin method, by Olson and De Turk (E. S. R., 85, p. 298), is prescribed for the determination both of the total boron content and for water-soluble boron. By adding water-soluble boron compounds to a soil containing no soluble boron and recovering the added boron quantitatively in the wafer-soluble condition, it was shown that the water-soluble-boron content can be determined quantitatively by adding water, boiling for 5 min., and completing the determination in the filtrate.

**Soil content of fluorine and its determination, W. H. MACINTIRE.** (Tenn. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 1, pp. 105-109).—Samples of from 0.5 to 1 gm. are ignited with calcium hydroxide or peroxide and distilled with 60-percent perchloric acid in the presence of a little silver sulfate. The distillate is titrated in accordance with the method of Willard and Winter (E. S. R., 69, p. 489).

**Determination of total, organic, and available forms of phosphorus in soils, R. H. BRAY and L. T. KURTZ.** (Ill. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 1, pp. 39-45).—For total phosphorus, the authors have selected a perchlorate digestion procedure followed by a colorimetric phosphate determination, for which sulfomolybdic acid (molybdenum trioxide dissolved in concentrated sulfuric acid) is used with metol (the sulfate of *p*-methylaminophenol) as reducing agent. Color readings are made in a photoelectric colorimeter. In a discussion of available forms of phosphorus, it is pointed out that both the acid-soluble phosphates, determined by the older methods for estimating available phosphate, and the adsorbed phosphates are actually available. Two quick-test technics, of which one shows the adsorbed phosphates and the other both adsorbed and acid-soluble forms, are detailed, as are also two laboratory technics for the quantitative determination of the adsorbed and the acid-soluble forms, respectively. For organic phosphorus compounds, the method is essentially that described by Dickman and De Turk (E. S. R., 79, p. 7), modified by using an ammonium fluoride extraction method for the removal of the phosphate released from the organic matter.

**A concentrated basal medium for microbiological vitamin assay, E. H. SPITZER, E. A. BURNISON, C. BERGERON, and J. E. CALDWELL** (*Science*, 100 (1944), No. 2607, pp. 555-556).—"In the preparation of the riboflavin basal medium, alkali-treated photolyzed peptone, 1-(-)-cystine, and a yeast supplement, prepared and combined in the generally accepted manner, were dissolved in a minimum quantity of distilled water (approximately 5.0 percent solids) and adjusted to pH 6.6-6.8 with 5 N sodium hydroxide, using bromothymol blue as an outside indicator. The solution was then dried from the frozen state for a period of 36 hr., after which the dehydrated residue was removed and stored over phosphorus pentoxide at room temperature. A 2.25-percent solution of the desiccated product was used for the riboflavin basal medium to which was added anhydrous glucose at a level of 2.0 percent." Tabulated results are presented to show the response of *Lactobacillus casei* to riboflavin on this medium stored at 75° F. over phosphorus pentoxide for a period of 12 weeks. The authors consider that in view of the many variables in the standard curve, produced by variation in incubation time, temperature, lots of approximately standardized alkali, and other factors, the medium may be considered as maintaining its original characteristics for a period of 12 weeks.

The niacin basal medium as prepared by Krehl et al. (E. S. R., 90, p. 727), with the exception that a folic acid concentrate was included, was similarly dehydrated.

A 2-percent solution of the dehydrated product was used, with anhydrous glucose and sodium acetate added at a level of 4.0 percent. Preliminary data, covering only a 3-week storage period, indicated results as successful as those obtained with the riboflavin basal medium.

The biological assay of vitamin A by means of its influence on the cellular contents of the vagina of rats, L. I. PUGSLEY, G. WILLS, and W. A. CRANDALL (*Jour. Nutr.*, 28 (1944), No. 5, pp. 365-379, illus. 1).—A method of biological assay of vitamin A and its precursors based on the changes produced in the cellular contents of the vagina of ovariectomized rats is described. The dosage response relationship was analyzed by methods of variance and covariance and shown to be logarithmic. The method shows considerable advantage over the increase in weight method with respect to precision and economy of time, material, and effort. The enhancement of the biological activity of vitamin A by tocopherols has been confirmed, and a method of overcoming this effect in the estimation of vitamin A activity is described."

Factors in the destruction of carotene and ascorbic acid in kale, G. M. GILLIGAN, C. W. WOODMANSEE, and G. L. BAKER (*Delaware Sta. Bul.* 251 (1944), pp. 22-23).—The method developed to facilitate sampling of fresh kale of market size for carotene determinations involved quick freezing of a 1-lb. subsample of the field sample in a minimum time interval between picking and freezing. This resulted in no significant loss of carotene in the raw material, and was a distinct convenience in handling the material since the samples for carotene could be set aside while the ascorbic acid determinations were carried out. The frozen material was ground in the presence of dry ice, thoroughly mixed, and aliquots of 5 gm. of the ground material (in triplicate) were used for establishing the carotene content of the field sample. This procedure could not be applied to the ascorbic acid determinations since the freezing plus grinding resulted in large losses of ascorbic acid. Conversion to dehydroascorbic acid accounted for only part of the losses. Consequently, it was found that triplicate 25-gm. subsamples were required to establish the ascorbic acid content of the bulk sample.

A new procedure for the bioassay of vitamin C, E. W. CRAMPTON, B. C. COLLIER, L. D. WOOLSEY, and F. A. FARMER (*Science*, 100 (1944), No. 2609, pp. 599-600, illus. 1).—A ration mixture tested on approximately 2,000 guinea pigs over a 4-yr. period has been found to have the following attributes: It is vitamin C free, palatable, supports normal reproduction of mature females and practically normal growth of the young to maturity and subsequent reproduction, and consists of ingredients of relatively low nutritional variability, thus permitting reproducible results in growth or tooth development. The feed mixture consists of 15 percent ground No. 1 feed oats, 10.5 percent ground No. 5 Canadian northern wheat, 25 percent dried beet pulp, 10 percent linseed oil meal, 15 percent dried skim milk, 5 percent nonoily fish meal, 5 percent wheat-germ meal, 10 percent dried brewers' yeast, 4 percent bone char, and 0.5 percent salt (iodized at 0.1 percent KI). This mixture is pressed into pellets. Every other day a 0.5-cc. fish-oil supplement containing vitamins A and D is directly administered to the guinea pigs, and on alternative days they are given 6 mg.  $\alpha$ -tocopherol.

Using this diet, the 8 weeks' growth response of young male guinea pigs to graded doses of ascorbic acid (between 0.5 and 2.0 mg.) bore a linear relation to the log of the dose. The coefficient of variation in live weight gains was 29 percent. Using a different technic based upon the length to which odontoblast cells of the incisor teeth developed in the same period of time (8 weeks) the coefficient of variation was only 12 percent. No difference was found between males and females in this characteristic. No macroscopic scurvy developed during the 8-week period in young guinea pigs when the daily vitamin C intake was

0.5 mg. or greater. This 0.5 mg. was taken as the minimum level of ascorbic acid suitable for bio-assay.

The evaluation of the assay of vitamin P by means of the effect of low pressure on mice, A. C. KIBRICK and A. E. GOLDFARB (*Jour. Pharmacol. and Expt. Ther.*, 82 (1944), No. 23, pp. 211-214).—Attempts were made to assay materials with vitamin P activity (hesperidin, chalcone, "eriodictin," and related derivatives) by subjecting mice to low atmospheric pressure and examining for signs of pulmonary hemorrhage. No appreciable differences in results could be observed between the control and experimental animals under the conditions in which the experiments were made.

The *Aerobacter* fermentation of cucumbers during salting, I, II (*Michigan Sta. Tech. Bul.* 200 (1945), pp. 56, illus. 18).—The two parts of this bulletin constitute two separate papers.

I. *Bacteriological and biochemical studies of the organisms responsible for a new type of gaseous fermentation in cucumbers*, J. L. Etchells and F. W. Fabian (pp. 3-38).—Of 29 cultures isolated from cucumber fermentations at brine concentrations ranging from 20° to 60° salometer, 20 were studied in detail with respect to morphological, cultural, and physiological characteristics and placed in the *Aerobacter* genus. Eighteen of these 20 cultures revealed characteristics in closer conformity to those described for *A. cloacae* than to those for *A. aerogenes*. The remaining two cultures are regarded as varieties of *A. cloacae*.

Preliminary experiments dealing with the fermentation of dextrose and the cucumber juice by strains isolated are detailed. The gas produced from these media was composed solely of hydrogen and carbon dioxide. The composition of the gas from the fermentation depended upon the carbon source. A comparative study of the composition of the gases evolved from the fermentation of 14 carbon compounds showed proportions of hydrogen and carbon dioxide dependent upon the carbon source fermented. The fermentation of *l*-arabinose, dextrose, *d*-galactose, levulose, *d*-mannose, and saccharose yielded gas composed of approximately 1 volume of hydrogen and 2 volumes of carbon dioxide (1:2). The fermentation of *l*-xylose, rhamnose, maltose, raffinose, *d*-mannitol, *d*-sorbitol, and salicin yielded gas of approximately equal volumes of hydrogen and carbon dioxide (1:1). The fermentation of lactose yielded gas composed of approximately 2 volumes of hydrogen and 1 volume of carbon dioxide (2:1). The fermentation of cucumber juice yielded gas composed of approximately 1 volume of hydrogen to 5 volumes of carbon dioxide (1:5).

II. *The Aerobacter and yeast fermentation of cucumbers under commercial conditions*, J. L. Etchells, I. D. Jones, and F. W. Fabian (pp. 39-56).—Generally, it was found that the 60° salometer salting treatment gave most consistently what is termed the typical hydrogen fermentation. The gas evolution and the composition of the gases in typical fermentations in both 40° and 60° brines showed two distinct phases. The first was brought about by the *Aerobacter* group, and during the active period hydrogen and carbon dioxide were evolved in the proportion of about 1:1. The second phase was brought about by the yeasts, and the gas evolved during their activity consisted principally of carbon dioxide. In the 40° fermentation, approximately four-fifths of the gas evolved was produced by the *Aerobacter* group; the remainder by the yeasts. In the 60° fermentation, approximately one-fourth of the gas evolved was produced by the *Aerobacter*; about three-fourths by the yeasts. In general, 20°, 40°, and 60° brines revealed that the fermentations at the higher salt concentrations resulted in larger quantities of evolved gas. Typical yeast fermentations resulted from all brine treatments (20°, 40°, and 60° salometer) employed for salting cucumbers. The differences in salt concentrations did not materially influence the number of yeasts found in the brine. Also, there was no definite

correlation between the maximum numbers of yeasts present in the brines and the volumes of gas evolved during their active growth.

The gas from "bloaters," or hollow cucumbers, formed during the active phase of the hydrogen fermentation, had practically the same composition with respect to hydrogen and carbon dioxide as did the gas collected from the surface of the brine. This relationship existed only during the actual formation of the bloaters, however.

The discoloration of sweet potatoes during preparation for processing and the oxidase in the root, L. SCOTT, C. O. APPLEMAN, and M. WILSON (*Maryland Sta. Bul. A33* (1944), pp. 11-26+, illus. 9).—A discoloration of sweetpotato tissue after commercial lye peeling of the roots could be duplicated by subjecting the root tissue to water bath temperatures of 60° to 90° C. The tissue temperature must reach about 60° for subsequent discoloration in the presence of oxygen, but the discoloration itself may occur at a much lower temperature. Roots peeled by hand and not heated did not discolor. The sweetpotato was found to contain a very active oxidase which is highly specific, acting *in vitro* only upon compounds containing two hydroxyl groups in the ortho position. The extent of heat discoloration was dependent upon the activity of this catechol oxidase. The heat discoloration did not occur if the susceptible tissue quickly attained a temperature of 90°. The oxidase was inactivated at about this temperature. Treatments which blocked the oxygen respiration of sweetpotato tissue without affecting the catechol oxidase activity resulted in tissue discoloration. Oxygen respiration of slices ceased at about 60°, the minimum temperature for heat discoloration. The quantity and location of the oxidase in the sweetpotato varied widely among varieties and among individual roots of the same variety. Selected improved strains of certain varieties contained much less oxidase than the parent variety.

During commercial lye peeling the tissues subject to heat discoloration attain a temperature well above the minimum of heat discoloration, but not high enough to inactivate the catechol oxidase. Preheating the roots before lye peeling in a 50° water bath for 30 min. prevented, or greatly lessened, subsequent discoloration. The penetration of heat during lye peeling of the preheated roots raised the temperature of tissue subject to discoloration high enough to inactivate the oxidase without undue destruction of the sweetpotato tissue.

Packing dry whole milk in inert gas, S. T. COULTER and R. JENNESS (*Minnesota Sta. Tech. Bul. 167* (1945), pp. 32+, illus. 12).—The increase in the oxygen content of the head-space gas in cans of dried whole milk after single evacuation and gassing was found roughly proportional to the total volume of entrapped air in the powder particles. Actual adsorption on the surfaces of the powder particles represents, at most, a minor portion of the retained oxygen. The air is retained in the powder under evacuation because the walls of the air cells are a highly concentrated lactose sirup (glass) which is relatively impermeable to gases. The presence of foam in the milk sprayed may increase greatly the volume of air entrapped in the powder particles, although powder from milk deaerated before spraying does not contain less air than powder from normal milk.

When the quantity of oxygen surrounding the powder particle is reduced by evacuation and inert-gas packing or by holding continuously under a vacuum, the oxygen diffuses from the air cells until equilibrium is attained. The diffusion occurs at such rates, characteristic for each powder, that the logarithm of concentration is inversely proportional to the logarithm of time, a result both predicted by a mathematical analysis and confirmed by the actual findings of the experimental work. The final oxygen content of gas-packed powder may be reduced by regassing after a time interval or by holding the powder continuously under a vacuum. This reduction, which is proportional to the rate of diffusion, is of sufficient magnitude in 20 hr. to offer a very effective method of lowering the oxygen level. Furthermore, the vacuum-holding treatment can be utilized to lower the moisture content of the

powder. In single gassing, the equilibrium oxygen level is reduced by only about 0.0275 percent per millimeter decrease in pressure. This is the theoretical reduction due solely to evacuation of the bases from the free space of the can. Since the rate of diffusion of the oxygen is dependent upon its pressure in the can, evacuation to low pressures in double gassing or in vacuum holding is more effective than in single gassing. Nitrogen and carbon dioxide were found equivalent as inert gases for packing dried whole milk insofar as oxygen levels are concerned.

## AGRICULTURAL METEOROLOGY

**Dissemination and use of atmospheric analyses,** W. F. BERNHEISEL (*Amer. Met. Soc. Bul.*, 26 (1945), No. 4, pp. 103-109).—Plans whereby the accomplishments of a small group of analysts may be disseminated to and used by many weather stations are now receiving much attention. Through these "canned analyses" mass production methods apply to meteorology; they are the means whereby many weather stations may benefit from the specially equipped and staffed weather central ideally located for the reception of observational data. This discussion is concerned with what canned analyses are, why they are important, how they may be used, obstacles limiting their use, and their dissemination.

**Measurements of dry atmospheric cooling in subfreezing temperatures,** P. A. SIPPLE and C. F. PASSEL (*Amer. Phil. Soc. Proc.*, 89 (1945), No. 1, pp. 177-199, illus. 7).—The freezing of 250 gm. of water in a cylinder of pyrolin, suspended freely under variable atmospheric conditions whose temperature and wind velocity were known, was carefully timed in a series of 89 experiments. Under the experimental conditions in Antarctica, outgoing radiation always exceeded incoming radiation, and absolute humidity was so low that cooling by evaporation was discarded from the study. Dry-shade cooling rates of the air were calculated for each experiment in terms of kilogram calories of heat lost in 1 hr. from an equivalent exposure of water 1 m. square. For convenience, a formula for computing the approximate total cooling rate of the air was adopted, based on a neutral comfortable human skin temperature of 33° C. as the zero point of the scale under calm conditions and assuming an average outgoing radiation and average convection for further simplification. Although these last factors are in some cases responsible for minor discrepancies between calculated and true values, they are apparent in the main only in very low wind velocities for convection and for radiation when there is reflected light and the temperature differential is either very narrow or extremely wide.

The values of atmospheric cooling were found to average 25 to 30 percent less by application of the formula than those derived from the kata thermometer by L. Hill. A closer agreement was found between the authors' measurements of atmospheric cooling and that by the Pierce laboratories of heat loss from the human body. During calm conditions, however, the authors' formula may show too rapid cooling, whereas during high wind velocities (over 12 m. per second) the extrapolated deductions by the Pierce laboratory formula may show excessive cooling. It is believed that the formula offered is accurate within average limits of meteorological data generally available, and that by means of simplified tables and nomograms provided it presents an easier method for rapidly calculating dry-shade atmospheric cooling values in terms of human comfort. The added value of presenting cooling in terms of large calories renders it possible to calculate directly stress against general metabolic heat generation for the human body, clothing insulation values, housing insulation, fuel consumption, etc. Comparisons of mean monthly cooling values and extremes are shown for 12 weather stations in Antarctica; similar comparisons and isocooling maps of other continents should prove of considerable value in studies of geography and bioclimatology. The

authors have correlated cooling with relative comfort sensations under varying climatic conditions and have established lower limits at which freezing progresses more rapidly than heat is supplied through body tissues, thus causing quick freezing of human flesh. Although their formula for the cooling of a small body of water may not adequately express cooling for the human body as a whole, it does approximate the volume of the extremities which are actually the most dangerously affected in cold weather and which require greater protection during short periods than does the trunk. There are 45 references.

Acclimatization and the effects of cold on the human body as observed at Little America III, on the United States Antarctic Service Expedition 1939-1941, R. G. FRAZIER (*Amer. Phil. Soc. Proc.*, 89 (1945), No. 1, pp. 249-255, illus. 6).

Bioclimatic measurements of UV-solar and sky radiation in Washington, D. C., 1941-1944, W. W. CORLENTZ (*Amer. Met. Soc. Bul.*, 26 (1945), No. 4, pp. 113-117, illus. 3).—The data here reported are a byproduct of an investigation of a suitable photoelectric dosage intensity meter and methods of measuring the biologically effective component of ultraviolet radiation for use in heliotherapy. The apparatus and methods are described, and a summary of the results of measurements is given.

Drought in the United States analyzed by means of the theory of probability, G. BLUMENSTOCK, JR. (*U. S. Dept. Agr., Tech. Bul.* 819 (1942), pp. 63+, illus. 9).—This bulletin develops a statistical method for describing the occurrence of drought and shows how drought hazard can be expressed in terms of chance, based on tabulations for a large number of stations in the United States for 1898-1937. The theory of runs was used to determine the annual distribution of drought to be expected from a random arrangement of dry and rainy days; the application of the theory is detailed. It was noted that for different climatic areas the closeness with which the observed distributions approximated an exponential curve was, in general, proportional to the uniformity of drought hazard from season to season. Analysis of drought by the theory of runs for monthly, seasonal, and annual time intervals indicated that observed drought differed from random occurrence in two ways: (1) The days of observed rainfall tended to cluster more than might be expected from a random arrangement of dry and rainy days. This clustering does not, however, preclude the possibility that once a dry period has begun additional days of drought occur at random. Drought probability was defined in terms of number of droughts and total number of days of drought observed, without regard to the distribution of days of rainfall. (2) In further comparing the theoretical and the observed drought distributions, it was found that there was an excess of observed short (1-6 days) and a deficiency of longer droughts; but this deficiency rapidly disappeared with increase in drought length.

These results may also be expected meteorologically. In many areas frontal precipitation occurs at irregular intervals, averaging 4 or 5 days apart. Together with prefrontal and postfrontal showers these recurrent frontal storms would tend to make short droughts more likely than random occurrence would indicate. Under such conditions, droughts of moderate length would be observed less frequently than anticipated, but in the case of longer droughts (over 16 to 20 days) the factor of recurrent frontal passage would be minimized. Since observed occurrence of long droughts was adequately represented by the theoretical distributions, these distributions were used in estimating future drought hazard. Through use of the technics developed, it was shown how drought hazard can be approximated where the minimum length of the required drought and the time interval within which it must occur were adjusted at will; nevertheless, the study

is primarily a methodologic one. Only one definition of drought was used, and for that definition the data are presented in the most useful form for a sample station only. There is no apparent reason, however, why the observed results should not be repeated with a change in definition. If the definition can be changed, a series of families of curves can be prepared for any station or area; these curves would make possible the estimation of drought hazard where the definition of drought could also be chosen to fit the problem at hand. Construction of families of such curves for a large number of stations is now in progress; these should prove of significant value to climatologists, soil conservationists, agronomists, and others concerned with the causes or effects of drought.

Improvements in the gauging of rainfall, C. L. WICHT (*Jour. So. African Forestry Assoc.*, No. 12 (1944), pp. 19-28, illus. 3).—The methods in use for gauging rainfall are reviewed (22 references), and it is shown that a number of improvements are needed to exclude or reduce serious errors. It is proposed that random sampling should be introduced to replace established methods. In order to reduce the number of gages required to estimate the variability of rainfall over an area, a method of circulating gages over a large number of fixed positions is suggested. Shielding of gages from the wind is considered essential and a Nipher-type shield is proposed. The need of erecting gages perpendicular to slopes is also stressed. Special gages designed to estimate direction and inclination of rain and to measure horizontal misty rains are described. Experimental evidence is given of considerable evaporation of rainwater from monthly-read gages and of the efficacy of introducing liquid paraffin to prevent such evaporation. An analysis of experimental data is made to indicate that casual errors only slightly affect the readings of standard 5-in. gages.

Effects of torrential rain near Heppner, Oregon, R. T. MICHENER and T. I. WILSON. (U. S. D. A.). (*Northwest Sci.*, 19 (1945), No. 2, pp. 31-33, illus. 4).—Local data are given which show the benefits of strip cropping against erosion from a torrential rain.

Rainfall periodicity in relation to malaria and agriculture in the Near East, H. DE TERRA. (Ohio State Univ.). (*Science*, 101 (1945), No. 2634, pp. 629-631, illus. 1).—The author approaches this complex question of climatic changes by analyzing observable climatic records—rather than inferences drawn from historical records—and relating them to the better-known scourges like malaria and crop failures; a preliminary study of these records tended to disclose that a very real control has been exercised over the welfare of the Near East for the past 30 yr. by minor climatic variations. In this case it appears that rainfall periodicity, once recognized and substantiated by more data, may actually lead to the prediction of conditions conducive to epidemics and crop failures. "In this manner it may be possible not only to undertake preventive measures but to understand more clearly the relationship between climate and human planning."

Plant disease and the weather (*Nature [London]*, 155 (1945), No. 3932, pp. 308-309).—Progress in this field is briefly reviewed as exemplified in a recent symposium at the West of Scotland Agricultural College.

Climate of Indiana, S. S. VISHER (Bloomington: Ind. Univ., 1944, pp. 511, illus. 492).—Many people in any region are interested in studies of the local climate, partly because a knowledge of what has gone before is the best basis for prediction. Moreover, in order to use the soil and numerous other resources efficiently, an adequate knowledge of the climate is essential; a better selection and distribution of crops is facilitated by such knowledge. The first chapter of this volume—a summary of the next 18—states the main aspects and bases of Indiana's climate. The bulk of the book is devoted in turn to each of the climatic elements. Then a chapter considers changes in climate, followed by 3 on some

effects of the climate and weather on agriculture—especially crop yields, and on the surface of the land—particularly on soil erosion and topography. This is followed by chapters on climate and health and on the climatic subregions of Indiana. Finally, as a sort of appendix, details are given as to the climate of individual cities. At the beginning of most of the chapters, after the first, are given the broader aspects of the subject dealt with. The climatic data are largely based on the climatological records accumulated by the Weather Bureau stations, and the factual material is partly presented on more than 400 readily comprehended maps rather than in detailed tables.

## SOILS—FERTILIZERS

**Soils of Imperial East Mesa, Imperial County, California,** R. E. STORIE, W. W. WEIR, R. C. COLE, and E. P. PERRY (*California Sta., 1944, pp. 7+, about 30 illus.*).—The brief text portion of this publication is concerned with the location and description of soils and the soil inventory. The soil inventory section contains a table classifying the soils by natural land division, soil type and phase, characteristics, and a soil rating consisting of the "Storie Index" (E. S. R., 70, p. 157) with the factors involved in its computation.

**The story of Indiana soils,** T. M. BUSHNELL (*Indiana Sta. Spec. Cir. 1 (1944), pp. 52+, illus. 53.*).—This circular briefly explains some of the major effects of glaciation, describes the soils and soil associations of 24 regions (examples of each being shown in one or more reproductions of aerial photographs), outlines the nature of the classification of soils, and sets up a grouping into general management classes, with indications of the best use and treatment of each such class. Further main headings of the circular are: The general soil regions of Indiana; simplified interpretations of the regional soil map; appendix containing suggestions as to sources of more detailed information; a table showing the extent of soil regions and major soil types of Indiana; and a key to Indiana soils.

**A comparison of methods for determining and expressing soil aggregation data,** G. M. BROWNING, M. B. RUSSELL, and J. R. McHENRY. (Iowa Expt. Sta. and U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 8 (1943), pp. 91-96, illus. 9.*).—Comparing various methods for determining and expressing soil aggregation, the authors showed that there is a positive curvilinear relation between the coefficient of aggregation and the percentages of aggregates  $>0.10$ ,  $>0.25$ , and  $>0.5$  mm. The relation decreased as the size of the aggregate increased. They showed also a linear relation between the percentage aggregates  $>0.1$  and percentage aggregates  $>0.25$  mm.

Under the conditions specified, the methods used grouped the soils or treatments in the same relative order, with few exceptions. A general relationship between the methods was evident. The authors consider, however, that further analyses must be made before it can be concluded that any one method is as good as or better than any other method.

**Influence of nature of soil colloids and degree of base saturation on growth and nutrient uptake by cotton and soybeans,** A. MEHLICH and W. E. COLWELL. (N. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 8 (1943), pp. 179-184, illus. 5.*).—Three mineral soils, different in their pH-base saturation relationships and widely different in their contents of kaolinitic and montmorillonitic material, were treated with  $\text{Ca}(\text{OH})_2$  to identical but increasing degrees of Ca saturation. Sand was added to obtain a base-exchange-capacity level of 4 milliequivalents per 100 gm. This series was divided into two magnesium levels, one constant and the other of increasing Mg content, to maintain a constant Ca:Mg ratio. Cotton was grown for a period of 40 days. Dry weights and contents of mineral constituents were

mixture of the 4-m. e series was further diluted to give a base-exchange capacity of 2 m. e. After 54 days the tops were harvested, dry weights were obtained, and percentage nitrogen and certain mineral constituents were determined.

Yields from the montmorillonitic soil showed gradual and consistent increases from added calcium with a maximum at 80 percent, the highest experimental level. In the kaolinitic and organic soils the increase from the first increment of Ca was pronounced with no measurable effects above 40 percent Ca saturation.

Calcium uptake from the kaolinitic soil by cotton and soybeans was invariably higher than that from the montmorillonitic soil. That from the organic soil was intermediate in the 4-m. e. series and highest in the 2-m. e. series. The Ca content of soybeans was related more directly to percentage saturation than to total amounts of Ca present in the organic and montmorillonitic soils, whereas, in the kaolinitic soil, it was related more directly to total Ca content. The nitrogen content of soybeans increased with increasing percentage calcium saturation in the montmorillonitic, but not in the kaolinitic soil. In the montmorillonitic soil, it was reciprocally related rather to total exchangeable H than to exchangeable Ca for a given percentage base saturation. Total uptake of Ca and Mg, expressed as percentage of the original exchangeable cations present, showed that release of Ca is high in the kaolinitic and organic soils, and decreases with increasing saturation. In the montmorillonitic soil the Ca release was low and little affected by degree of saturation. Release of Mg from the montmorillonitic soil was high. From the kaolinitic and organic soils it was low. Results obtained from a soil consisting of a mixture of approximately equal portions of 2:1- and 1:1-type clay minerals showed the montmorillonitic fraction exerted a predominating influence upon growth and mineral nutrient uptake. Equilibrium exchange of Ca and Mg by H-ions at symmetry concentration showed that the filtrate of the montmorillonitic soil became relatively richer in Mg and that of the kaolinitic soil relatively richer in Ca.

**Some seasonal changes in the pore space and moisture relationships of woodland, pasture, and cultivated soils, F. R. DREIBELBIS and F. A. Post. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 102-108, illus. 4).**—The volumes of solids, water, and air in soils from cultivated watersheds on Keene silt loam and on Muskingum silt loam and from a pasture and a woodland watershed on the latter soil were determined at monthly intervals from August 1939 to July 1940. Pore-size-distribution data were also obtained from three profile layers of soils from these areas in 1942. The results provide information on the potential infiltration and transmission capacity of the soil and indicate the volume of water that may be stored under average conditions throughout the profile at monthly intervals during the year, as well as the storage opportunity remaining. Hydrographs of runoff in a storm in April 1940 from all the watersheds studied except the woodland, where no runoff occurred, are also included.

The pore-size-distribution data indicate the effective pore sizes of the soil drained at various tensions. The values at a tension of 40 cm. (pF 1.6) indicate the approximate dividing line between capillary and noncapillary pores. This value, subtracted from the value at saturation, gives that quantity of water which is likely to contribute the most toward percolation. Data showing the percentage saturation at pF 1.6 of each of three layers of soil in profiles from the four watersheds are given, and their relationship to percolation is discussed. Pore-size-distribution data are given also for the surface soils of four watersheds for three sampling dates in May, July, and October 1942 to represent the changing conditions in soil porosity characteristic of soil structure.

**The conductivity of soil extracts in relation to germination and growth of certain plants, E. C. DUNKLE and F. G. MERKLE. (Pa. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 185-188, illus. 11).**—In a greenhouse experiment involving the growing of several different field and greenhouse crops in graded

concentrations produced by adding a 4-10-10 fertilizer in amounts equivalent to 1,000, 3,000, 5,000, 7,000, 9,000, 12,000, 15,000, 18,000, 21,000, and 24,000 lb. of fertilizer per 2 million lb. of soil, corn germinated and grew at all concentrations employed, though the rate of germination was slowed by the higher salt concentrations. Soybeans, known to be a sensitive crop, had germination reduced to 60 percent at a conductivity of  $180 \times 10^{-6}$  (the specific conductivity of the 1:2 soil-water extract measured at 25° C. and expressed as reciprocal ohms). A conventional application through the grain drill of 150 lb. of the 4-10-10 fertilizer might cause a similar reduction in stand. Germination of tomatoes was seriously reduced by soils with conductivities of  $200 \times 10^{-6}$  or greater, and growth declined materially at conductivities above  $300 \times 10^{-6}$  under the conditions of this experiment. Potatoes suffered a retardation of germination by the higher fertilizer applications, though they appeared to tolerate the conditions imposed. Germination of cucumber seeds was depressed at conductivities greater than  $400 \times 10^{-6}$ , and growth declined at conductivities of  $271 \times 10^{-6}$  or greater. Cabbage showed a high tolerance to the amounts of fertilizer employed. Germination was reduced in soils with conductivities greater than  $400 \times 10^{-6}$ . Radishes of poor quality were produced in soils with conductivities greater than  $400 \times 10^{-6}$ . Germination was retarded by fertilizer additions in proportion to the amount of the addition and magnitude of the conductivity. Subsequent growth tolerated concentrations higher than those ideal for germination. Growth was not increased in any instance by concentrations that produced conductivities of the 1:2 soil-water extract greater than  $227 \times 10^{-6}$ . Since rate of germination is always depressed and total germination is always depressed and total germination and growth are never improved above this value, there is no advantage, but a possible disadvantage, in exceeding it. The relationship between soluble salts and conductivity in these pots at the conclusion of the experiment was identical with that obtained in a study of a large number of widely different greenhouse soils. This was not true of a study of these soils made 2 weeks after mixing soil and fertilizer, however.

Some slope and water relations affecting the movement of soil particles, J. F. LUTZ and B. D. HARGROVE. (N. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 123-128, illus. 6).—The experiments here reported upon were made by means of a smooth concrete slab with metal sides so constructed and mounted as to be adjustable to any desired slope. A uniform nonturbulent flow of water was maintained.

It was found that the velocity required to move a soil particle varied with discharge, depth, and slope. Generally, as slope increased depth decreased, thereby causing an increase in the velocity required to move the particles. At the lesser slopes, however, at which depth was relatively great, the velocity required to move the particles decreased with increased slope; but from 2.0 to 4.5 percent slope the velocity required to move the particles increased with increased slope. From 4.5 to approximately 6.75 percent slope the velocity required to move the particles was constant. From 6.75 to 9 percent slope the velocity increased again with increased slope and decreased depth. Depth of water at the 6.75 percent slope in the velocity curve was approximately 0.40 of the particle diameter, at which gradient the depth appeared to have its minimum effect in its tendency to cause the movement of particles. When the depth of flow was in the diameter range of given size particles, the loss from a sample of that particle size was greater than from any sample of larger or smaller particles.

Equations from which it is possible to calculate the loss of any particle size used under given conditions were derived. High correlation between the loss for any given size particles and the discharge and slope was found. The *R* values for all particle sizes were greater than 0.97. A nomograph with fixed scales for

$\log S$  and  $\log Q$ , and sliding scales for  $\log E$ , or loss, for the different size fractions is presented.

Investigations in erosion control and reclamation of eroded Shelby and related soils at the conservation experiment station, Bethany, Mo., 1930-42, D. D. SMITH, D. M. WHITT, A. W. ZINGG, A. G. MCCALL, and F. G. BELL. (Coop. Mo. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 883* (1945), pp. 175+, illus. 53).—As concisely stated in a foreword by H. H. Bennett, this bulletin of the series (E. S. R., 92, p. 17) is "a report of technical advances in conservation farming during 13 yr., showing not only methods used, but also the basic factors involved. They are set down clearly, and they are authenticated by figures, plates, tables, and other data, concisely presented." It is "a manual or handbook for technicians and for technicians only. Any soil and water conservation technician working on the Shelby and related soils of Missouri, Iowa, Kansas, and Nebraska will have in his copy of this report a handy pocket guide for determining degrees of slope for terrace channels, the vertical fall between terrace crests, and expectancy of protection to be derived from various kinds of cover crops on different soils and slopes, the amount of water likely to be conserved from the average rains for crop use under various conditions of slope and soil treatment, and so on."

Investigations in erosion control and the reclamation of eroded land at the northwest Appalachian conservation experiment station, Zanesville, Ohio, 1934-42, H. L. BORST, A. G. MCCALL, and F. G. BELL. (Coop. Ohio Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 888* (1945), pp. 95+, illus. 44).—The 9-yr. period covered by this report (1934-42) yielded numerous detailed observations and the general conclusion that land conservation in the area under study demands a somewhat radical departure from established practices. "In general, the type of agriculture indicated is one in which grasses and legumes play a major role. On hill-land farms the growing of crops should be restricted insofar as possible to those areas best suited by topography to their production—to fairly level bottom lands and the gentler slopes. The remainder of the farms, in fact the most of the acreage, should be devoted to pastures, pasture meadows, and woodland. In the broad, comparatively level valleys, attention should be directed chiefly to agronomic problems rather than toward erosion control. The cropping of hill lands should be carried on only with all feasible practices for erosion control. Emphasis should be shifted from erosion-control practices in the narrow sense to a broader, more inclusive program designed to conserve productive capacity of soils in the fullest sense of the term. Calcium, phosphorus, and potassium must be supplied liberally in manures or commercial forms. Grass and legumes, particularly, require an adequate supply of these mineral elements. A sound fertility program is fundamental to the conservation of the soil. The rotations should include 2 yr. or more of sod crops. Meadows should be seeded with long-lived, deep-rooted legumes. Strip cropping, fortified by diversions and terraces where necessary, should be practiced."

In detail, the findings reported are similar to those of other work on runoff, soil losses, effects of mulches on the results of natural or artificial rainfall, etc.

The comparative effects of surface application vs. incorporation of various mulching materials on structure, permeability, runoff, and other soil properties, R. B. ALDERFER and F. G. MERKLE. (Pa. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 79-86, illus. 7).—After 3 yr. or 4 yr. of treatment, neither the surface application nor the incorporation of mulching materials had effected statistically significant differences in the structural stability indices of the soil studied as compared with those of the fallow check plots. Surface mulching effected a very significant increase in the size and frequency of the larger

soil granules, mostly in the 0- to 1-in. layer. The numbers and size of these larger granules decreased with increasing depth in the surface soil. The order of decreasing effectiveness in producing these large granules throughout the surface soil among the mulches was manure, oak leaves, corn stover, sawdust, pine needles, bluegrass clippings, and straw. Incorporating these mulching materials produced a slight increase in size of soil granules at the 3- to 6-in. level. Only manure was especially effective when used in this way. Surface application was superior to the incorporation of these mulching materials in effecting an increase in the size and number of large, water-stable soil granules. Fertilizer treatment without cropping had a negligible effect on the structure as compared with that of the untreated check soil.

Surface mulching resulted in the maintenance of an optimum soil moisture content even during the driest portions of the growing season as compared with the practice of wholly incorporating the mulching material. The latter soils became dry, especially during the dry 1941 season. Three and 4 yr. of mulching with manure, straw, sawdust, corn stover, oak leaves, and pine needles has resulted in complete control of surface runoff and effected an infiltration capacity equal to, or in excess of, 3 in. per hour, as determined by the use of an artificial rainfall apparatus. The residual effect on the structure and permeability of the soil of these mulches upon removal was found to be greatest in the case of pine needles, less in the case of manure, oak leaves, corn stover, and sawdust, and least with wheat straw. The reapplication of these mulching materials on the soil for 1 day resulted in a very significant increase in infiltration capacity. Whereas the uncovered plots lost 45 to 60 percent of the rain applied as runoff, the same plots recovered with mulch lost only 3 to 10 percent of a 3-in. per hour rain. The total incorporation of mulching material except manure did not increase the infiltration rate after the soil was wetted to field capacity. Less runoff occurred, however, from the mulch incorporated plots when rain was applied to them in their air-dry condition. The results of this investigation indicate that the chief value of the mulch in controlling runoff lies in its protective effect rather than in any fundamental structural change brought about after 4 yr. on the soil.

Surface application of these mulching materials resulted in an increase in the soil organic matter content which was most pronounced in the 0- to 1-in. surface layer. Incorporation of manure, sawdust, charcoal, and peat increased the total organic content of the soil. These increases, due to the presence of the more biologically inert materials, are believed to be of questionable qualitative significance.

**Saving soil with mulch from winter cover crops, R. WOODBURN (*Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 4, pp. 1, 2*).**—Experiments of 1 year's duration on six plats, each of 0.005-acre area and of 9-percent slope, are reported upon. The plats were in vetch or oats and wild winter peas the winter of 1943-44, with a very heavy cover on the plats when turning was started in March 1944. Half of the plats were spaded to represent plowing with a turn plow. Cover on the remaining plats was hoed in (2- to 3-in. depth) to represent field disking. Soil and water losses and yields for the 1944 season are shown in a table.

The vetch spaded under lost almost 10 times as much soil during the cotton season as vetch hoed in. Spading of oats and peas resulted in almost six times as much soil loss during the cotton season as hoeing in. A bare plat nearby lost 83 tons of soil per acre from April 1 to October 1. The soil-saving effected during the heavy April rains by the vetch trash remaining on the surface following hoeing persisted to a considerable extent through the growing season, being quite evident in July, a month of heavy rainfall. Yields of oats and peas were not significantly affected by these differences in treatment. Cotton yield on the vetch plats was slightly greater than on the spaded plats.

**Winter legumes save soil even after turning.** R. WOODBURN (*Miss. Farm Res. [Mississippi Sta.], 8 (1945)*, No. 5, pp. 1, 2, illus. 2).—Although the surface looked about the same after spading vetch and a light weed growth, more soil loss occurred for the April rains on plots following weeds than on plots following vetch. This trend occurred on five different slopes and for five distinct rains. Although the canopy protection by the cotton greatly reduced erosion losses and masked differences between vetch and no-vetch plots, the soil-saving effect of the vetch appeared to continue to some extent during the summer. Vetch after spading under still had a reducing effect on runoff, except on the steepest plots. Saving in soil was in greater proportion than saving in water. Soil was saved even on the steepest slope where there was no runoff difference.

**Soil management on heavy clay (Buckshot) soils.** J. PITNER (*Miss. Farm Res. [Mississippi Sta.], 8 (1945)*, No. 4, pp. 1, 3, 6).—Experiments on a local soil condition characterized by poor internal and external drainage and high percentage of fine soil particles, responsible for the many difficulties encountered in preparing a good seedbed, are reported upon. About the only way to be certain of a good seedbed in time for spring planting is to bed the land in the fall. After a few years of cultivation, the loose, mellow condition disappears and the soil becomes heavy, tight, and difficult to manage. Treatments included fallowing, the addition of much leguminous and nonleguminous material, rotations with summer and winter legumes, and rotations including the fallowing of soil after oats and the growing of alsike clover following oats. Adding to the organic-matter content of the soil and fallowing each second or third year effected some improvement in the behavior and yield of these soils.

**The effect of fertilizers and the age of plants on the quality of alfalfa and sweet clover for green manure.** J. F. DAVIS and L. M. TURK. (*Mich. Expt. Sta.*). (*Soil Sci. Soc. Amer. Proc., 8 (1943)*, pp. 298-303, illus. 1).—Alfalfa grown on plots treated with 1,000 lb. of 0-12-12 fertilizer had, in both tops and roots, a higher content of phosphates, potassium, and nitrogen compounds than that without fertilizer; but no significant difference in the percentage of calcium or magnesium was found. Fertilizer increased the percentage of phosphates and nitrogen in the tops and roots of sweetclover, but did not appreciably affect the percentage of magnesium and potassium. The percentage of calcium was higher in the sweetclover grown without fertilizer.

Greater increased yields of Proso were obtained in the greenhouse from jars to which alfalfa grown on soil treated with 1,000 lb. of 0-12-12 fertilizer was added than from the jars in which the material was obtained from plots without this additional fertilizer. Similar increases in yield of Proso were obtained from sweetclover green manure grown with fertilizer. Ammonification and nitrification of fertilizer-treated alfalfa and sweetclover were more rapid than in the untreated. The superiority of sweetclover in comparison to alfalfa green manure under field conditions appeared due to the higher percentage of nitrogen in sweetclover and to its more rapid rate of nitrification. To a relatively large acreage of leguminous crops (sod-forming legumes) is largely credited Michigan's low demand for commercial nitrogen.

**Movement of nitrogen in soils.** B. A. KRANTZ, A. J. OHLOGGE, and G. D. SCARSETH. (*Ind. Expt. Sta.*). (*Soil Sci. Soc. Amer. Proc., 8 (1943)*, pp. 189-195, illus. 5).—In plots on four Indiana soils, ammonium cations were found to be rather immobile in the soil because they are adsorbed by the base-exchange complex, while the nitrate anions were found to move freely with the soil moisture. During seasons of prolonged droughts, nitrates moved upward in the soil to accumulate at the surface because of the net upward movement of soil moisture. Any moderate rainfall moved the nitrates back into the main root zone, however. When am-

monium sulfate was plowed under, a large portion of the applied nitrogen remained in the ammonium form in the moist root zone throughout the growing season. When ammonium sulfate was plowed down with straw, providing energy for bacteria to bring about a reducing environment, nitrate formation was retarded and even more nitrogen remained in the less mobile ammonium form. On silt loam soils, 55 to 65 percent of the applied nitrogen still remained in the ammonium form 100-150 days after such treatment. Ammonium sulfate applied as a top dressing remained on the surface of the soil and was completely unnnitrified after 23 to 25 dry days. Even after heavy fall rains practically no ammonium nitrogen moved below the 3-in. level in the silt loam soils. The surface layers of soils had an "apparent saturation capacity" of about 350 to 550 p. p. m. for ammonium nitrogen.

The addition of lime, phosphorus, and potassium, along with plowed-under carbonaceous organic matter and ammonium sulfate, increased biological activity and temporarily tied up more of the applied nitrogen in the organic form.

The diagnostic approach as applied to a long-time fertility experiment in Indiana, M. T. VITRUM and G. D. SCARSETH. (*Ind. Expt. Sta.*). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 295-297).—In a set of plots where several carriers of phosphorus have been compared, plant tissue tests, severe potassium starvation symptoms, yield data, and calculations of plant nutrients added and removed showed that potassium was the first limiting factor in the growth of corn on these plots. The yields of these plots, therefore, have been functions of the available potassium rather than of phosphorus, and the results which have been obtained in the past are deemed misleading. Plowing under 200 lb. of potassium chloride in the spring of 1942 at least partially corrected this situation. Tissue tests indicated adequate supplies of unassimilated potassium in the plants, starvation symptoms were not observed, and the yields were the highest ever obtained in the 24-yr. history of the experiment.

Effect of certain soil treatments on the cation exchange properties and organic matter content of Dunmore silt loam, C. I. RICH and S. S. OBENSHAIN. (*Va. Expt. Sta.*). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 304-312, illus. 6).—Fertilizer and cropping practices which tended to increase crop yields also tended to increase soil organic matter and cation exchange capacity. There was a significant, positive correlation between organic matter content and cation exchange capacity of the soil. The organic fraction seemed to be of greater importance than the mineral fraction in contributing to the cation exchange capacity of this soil. Superphosphate, rock phosphate, potassium chloride, and farm manure had little or no effect on soil reaction. Ammonium sulfate caused a reduction of the pH and exchangeable calcium and magnesium and an increase in exchanageable hydrogen. Of the total potassium applied as the chloride, an average of 15 percent remained as exchangeable potassium in the upper 6 in. of soil. The application of this fertilizer decreased exchangeable calcium but had no influence on the pH. Where farm manure was applied, exchangeable calcium, magnesium, potassium, and cation exchange capacity were increased significantly.

A 4-year study of the effects of crop, lime, manure, and fertilizer on macroaggregation of Dunmore silt loam, J. ELSON. (*Va. Expt. Sta. and U. S. D. A.*). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 87-90, illus. 1).—The soil under wheat had the same percentage of macroaggregates (1-8 mm. diameter) as that under corn, while clover showed a 10.3 percent increase over wheat and grass 9.1 percent over clover. The plots treated with fertilizers or manures had 8 percent more macroaggregates than had the untreated ones, while the manure produced 15 percent more than did the fertilizers. The difference in macroaggregation between the manure and fertilizer corn plots was greater than that for the other

three crops. All crops showed the same response to the individual manure or fertilizer treatments. The difference in macroaggregation between the manure and fertilizer plots showed no relationship to the period elapsed after liming, but was greater in wet seasons than in dry ones. Four manure treatments produced a similar improvement in aggregation. The response to eight fertilizer treatments showed considerable variation. Of the fertilizer elements, N, P, and K, all the main effects were significant. That of N was negative. Those of P and K were positive. The interaction of N with K was significant and positive. Those of P with K, of N with P, and of N with P and K were not significant.

**Availability of the phosphorus of various types of phosphates added to Everglades peat land.** J. R. NETLER (*Florida Sta. Bul. 408* (1945), pp. 28, illus. 8).—The 5-yr. average of air-dry carpet grass, cut four to six times a year for 5 yr. from plots treated yearly with a 6-12-12 mixture at the rate of 1,200 lb. per acre, was somewhat less than 6 tons per year for the superphosphate treatments and somewhat over 6 tons for the rock, basic slag, and colloidal phosphate treatments. Lime with the superphosphate depressed yields while sulfur was without effect. Percentage of phosphorus in the grass was slightly higher for the superphosphate treatment. Lime with superphosphate depressed this percentage and sulfur with superphosphate increased it to some extent. A comparable 5-yr. trial with Dallis grass resulted in about the same effects of phosphates on yields, all of which were higher than for carpet grass. Lime and sulfur were without effect on both yields and phosphorus content of Dallis grass. Considering growth and phosphorus content, best response of carrots, cabbage, potatoes, rape, and turnips was to superphosphate. Sugarcane and some cuttings of shallu were seriously reduced in yield under similar treatments with superphosphate. Corn responded to a lesser extent than to rock phosphate and basic slag.

The pH, phosphorus, and acidity data on leaf and stem saps of sugarcane, buckwheat, corn, rape, and shallu are given in an attempt to ascertain why these crops are of indifferent, and, in some instances, negative response to added available phosphate. Reaction (pH) was but little affected by any of the phosphate treatments. Phosphates and acidities were increased variably by the rock phosphate treatments, and to a high and more uniform peak by superphosphate.

**The solubility and reversion of calcium and potassium metaphosphates.** C. C. VOLKERDING and R. BRADFIELD. (*Cornell Univ. (Soil Sci. Soc. Amer. Proc., 8 (1943), pp. 159-166, illus. 8)*).—The presence of small proportions of  $\text{NaNO}_3$ ,  $\text{NaOH}$ ,  $\text{NaPO}_4$ ,  $\text{Ca}(\text{NO}_3)_2$ ,  $\text{Mg}(\text{NO}_3)_2$ ,  $\text{NH}_4\text{NO}_3$ ,  $\text{CaCO}_3$ ,  $\text{Ca}(\text{PO}_4)_2$ ,  $\text{HNO}_3$ , or  $\text{H}_2\text{SO}_4$ , greatly increased the solubility of potassium metaphosphate in aqueous solution. Potassium salts (such as  $\text{KNO}_3$  and  $\text{K}_2\text{SO}_4$ ) decreased slightly the solubility of potassium metaphosphate. Concentrations of  $\text{NaNO}_3$ ,  $\text{KNO}_3$ ,  $\text{Mg}(\text{NO}_3)_2$ , and  $\text{NH}_4\text{NO}_3$  up to 0.016 N had no effect or caused only a slight decrease in the solubility of calcium metaphosphate in aqueous solutions. The presence of  $\text{CaCO}_3$  greatly decreased the solubility of calcium metaphosphate but increased that of  $\text{KPO}_4$ . Additions of small quantities of  $\text{NaPO}_4$ ,  $\text{KPO}_4$ , and  $\text{NaH}_2\text{PO}_4$  increased slightly the solubility of calcium metaphosphate. The rate or extent of reversion of potassium or calcium metaphosphate to the orthophosphate was not affected by salt concentrations up to 0.020 N. Noticeable reversion of potassium metaphosphate took place on standing in  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$  solutions where the pH of the solution was below 4.0.

The calcium metaphosphate showed a marked increase in total phosphorus in aqueous solution on standing. The solubility of potassium metaphosphate in water increased only slightly on standing for a considerable length of time.

**Lime: Its importance and efficient use on soils.** A. R. MINGLEY. (*Vt. Expt. Sta. (Soil Sci. Soc. Amer. Proc., 8 (1943), pp. 329-333)*).—The author first sum-

marizes the known facts of the processes by which soils become acid under climatic conditions leading to their development as podzolic or lateritic types, and the double function of lime as a neutralizer of excess acidity and as a source of calcium. Reviewing, under the heading efficient use of lime, the observations of a number of investigators, he shows the importance of applying mixed coarse and fine liming materials and the advantages of frequent small applications of lime over large single applications—especially in lowering leaching losses and in inducing greater crop gains per unit of lime used. Also, soil reaction is changed more, per unit of lime, with small rather than heavy rates of lime application; the initial cash outlay is less; the ground stone can be hauled greater distances; and the farmer's own labor can be used. The lime may be delivered at any time during the year and spread at will, thus fitting well into the regular farm routine. With regard to method of applying small frequent applications, the author points out that, on the dairy farm, it can be used through the manure spreader. Limestone neither helps nor hurts manure, which soon ammonifies and becomes almost as basic as limestone itself. In this alkaline medium, limestone becomes less soluble and less active and thus drives off very little ammonia. Furthermore, the limestone becomes intimately mixed with only a small portion of the manure during spreading and can be added on top of a load of manure or, in windy weather, placed below it; both being spread at one time. In this connection, the addition of burnt or hydrated caustic limes before ammonification, to avoid direct loss of ammonia and to retard ammonification, is recommended. Penetration of lime and overliming are analyzed with similar thoroughness, the discussion of the last-named topic covering some of the author's own work on overliming injury and its chemical nature (E. S. R., 68, p. 598).

The effect of manganese sulfate on several crops growing on organic soil when applied in solution as a stream or spray on the crop, P. M. HARMER and G. D. SHERMAN. (*Mich. Expt. Sta.*). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 334-340, illus. 5).—On organic soil deficient in available manganese, the application of manganese sulfate, both as a weak solution and in a stream on the crop row and when added to bordeaux mixture applied as a spray on several crops, has given benefits similar to the striking result earlier reported by McLean and Gilbert of the Rhode Island Experiment Station (E. S. R., 54, p. 450).

Application of manganese in bordeaux spray appeared a cheap and very effective way of using it. The crops were somewhat more free from disease when sprayed with manganese-bordeaux than with the ordinary bordeaux. Application of manganese in the bordeaux was of greater benefit in a cool, wet season than in a hot, dry one and generally was more beneficial when included in the early sprays than in the late ones. The results indicate that manganese in the bordeaux, by maintaining a proper calcium-manganese balance, may prevent the harmful effects sometimes caused by the lime, and that the manganese-bordeaux may be found effective for use on certain crops on which ordinary bordeaux has proved injurious.

Sulfur-zinc relationships in some New York peat soils, E. V. STAKER. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), p. 345).—Certain peat soils in New York contain zinc in amounts detrimental to the growth of vegetable crops. It is now known that a part of the zinc is present as zinc sulfide. In a statistical study of 110 soils, a positive correlation was obtained between the sulfide sulfur and total zinc. When the soils were arranged in order of increasing amounts of sulfide-sulfur, it was necessary to include 95 of these soils before a correlation coefficient of 0.70 was attained. For this group, the mean average values were 6.63 milliequivalents for sulfide-sulfur and 18.74 m. e. of zinc per 100 gm. of oven-dry soil. The correlation coefficient for the remaining 15 soils, which were extremely high in both sulfide-sulfur and zinc, was  $0.8999 \pm 0.0331$ . Unproductive

peat soils carrying much zinc were found rarely to contain sufficient sulfur as sulfide to combine with all of the zinc present. However, in two highly productive soils low in zinc the sulfide-sulfur was present in considerable excess of the zinc, not only in the surface layers but in the subsoils as well. For the most part, a wide zinc : sulfide-sulfur ratio was associated with very poor growth, while a narrow ratio was correlated with fair to good growth.

**Commercial fertilizer usage in Delaware during wartime.** H. A. JOHNSON and J. F. DAVIS (*Delaware Sta. Pan.* 18 (1944), pp. 16+).—A survey was made to determine the number of farm operators growing various crops, the acreage of each, and the fertilizer formulas used for each crop. Percentage of each grade on the basis of the total quantity of fertilizer used is given in each instance.

Sweetpotatoes were the crop most heavily fertilized, followed by asparagus, cantaloups, tomatoes, cucumbers, and peas. Wheat received 26 percent of the fertilizer for which records were available, with tomatoes nearly 18, and corn and beans each 11 percent.

**How much fertilizer shall I use?** C. E. KELLOGG (*U. S. Dept. Agr., 1945, AIS-18*, pp. 6).—A gardener's guide for converting tons or pounds per acre into pints, cups, tablespoons, or teaspoons per row or plant.

## AGRICULTURAL BOTANY

**Fragmenta papuana (Observations of a naturalist in Netherlands New Guinea).** H. J. LAM, trans. by L. M. PERRY (*Sargentia [Arnold Arboretum]*, No. 5 (1945), pp. 196+, illus. about 32).—As stated by the translator in the preface, "although the botanical information . . . was the primary objective of the author, . . . I cannot but express something of the pleasure I have derived from Professor Lam's delightful pen pictures of the country and its inhabitants."

**On the microscopic methods of measuring the dimensions of the bacterial cell.** G. KNAYSI. (Cornell Univ.). (*Jour. Bact.*, 49 (1945), No. 4, pp. 375-381, illus. 8).—A comparative study of the cell width of *Bacillus mycoides* and *B. cereus* indicated that the value obtained depends on the treatment of the cells measured. Measurements of the living cells in the medium in which they are growing agreed with those of similar cells stained by a method showing the cell wall. In stained smears where the cell wall was not visible, the cells appeared much smaller than they actually were and represented the shrunken masses of the cytoplasm. In negative-staining smears, the cells may appear larger or smaller than their real size depending on the thickness of the surrounding dye film. Thus negative-staining smears are unsuitable for the study of cell dimensions.

**Death of bacteria by chemical agents: Review and discussion.** O. RAIHN. (Cornell Univ.) (*Biodynamica*, 5 (1945), No. 96, pp. 116, illus. 19).—In the fight against bacteria, a rather surprising variety of compounds is being used; it is not possible that all react with proteins in the same way, though all lead to the same general result—the inactivation of bacteria. The reason why so many different compounds are used is of a practical nature—sought above all in the various purposes for which they are employed; mercury compounds cannot be used in foods; salicyclic acid will preserve acid fruits but not neutral meat; chlorine is excellent for water but less efficient for sewage; propionic acid prevents the growth of molds but not of bacteria; sulfa compounds work well internally but are poor disinfectants *in vitro*. In this monographic presentation the customary distinction is made between disinfectants and antisepsics; though the specifications are arbitrary, a fundamental difference does exist between temporary reversible inhibition and the permanent irreversible inhibition required of disinfectants.

The discussion of disinfectants revolves around their selectivity, concentration and the death rate, temperature and disinfection, interference of foreign matter

and of antidotes with their action, properties of the various groups of disinfectants, and standardizing disinfectants including details of the procedure. Antiseptics are considered in their relations to temperature, their selective action, diluted disinfectants as antiseptics, effect of size of the inoculum, dual action of the dyes, mode of action of the sulfonamides, heightened efficiency of weak acids by increase in their acidity, and the antagonistic substances from micro-organisms. The bibliography covers about three pages.

Heat activation inducing germination in the spores of thermotolerant and thermophilic aerobic bacteria, H. R. CURRAN and F. R. EVANS. (U. S. D. A.). (*Jour. Bact.*, 49 (1945), No. 4, pp. 335-346, illus. 2).—Sublethal heating of the spores of many thermotolerant and thermophilic aerobes influences the number which will subsequently germinate. In a study of 12 thermotolerant cultures from 10 outbreaks of spoilage in commercially processed milk, nearly all responded to pregermination heating; in its absence a large proportion failed to germinate. Flat sour types (*Bacillus stearothermophilus*) proved heat-activatable. The proportion of spores responding to preheat treatment depended on the amount of heat, the composition of the medium in which heated, and the temperatures at which spores were formed and subcultured. The heating media arranged in the order of their effectiveness on heat activation were: "Glucose or lactose (0.5 percent) > peptone (0.5 percent) > skim milk > glucose nutrient agar > beef extract (0.3 percent) > glucose nutrient broth > distilled water > NaCl (0.5 percent)." The most favorable glucose concentration was about 0.1 percent; NaCl usually depressed heat activation at concentrations of 0.5 percent or higher. At 95° C. in skim milk the heat-activating process was nearly complete in 10 and entirely so in 30 min. Long-hold pasteurization effected material activation of the spores. The response to preheating was greater when the temperature of subcultivation was suboptimum than when it was at the relatively high optimum temperatures. Preheating of heat-activatable spores served to lower the minimum temperature at which germination could occur; this applied when the heat treatment was mild and nonlethal, as well as when it was so drastic that relatively few spores survived. The economic implications are discussed. Recognition of the phenomenon of heat activation and some understanding of the factors influencing it are essential to the accurate enumeration of viable sporing thermotolerant and thermophilic aerobes. The relationship of heat activation to certain commercial or laboratory practices is indicated.

The oxidation of glycerol by *Streptococcus faecalis*, I. C. GUNSLUS and W. W. UMBRETT. (Cornell Univ.). (*Jour. Bact.*, 49 (1945), No. 4, pp. 347-357, illus. 6).—Glycerol was found to be oxidized by *S. faecalis* (strain 24) at a rapid rate ( $Q_{10}(N) = 400-700$ ), the over-all reaction being: Glycerol + O<sub>2</sub> → lactate + H<sub>2</sub>O<sub>2</sub>. The pathway of this oxidation involves phosphorylation. The glycerol is phosphorylated to glycerol phosphate, which is oxidized to triose phosphate. The latter is converted into lactic acid. The oxidation is inhibited by the accumulation of H<sub>2</sub>O<sub>2</sub> to a concentration of 0.002 M. Various properties of the enzyme system are described.

Microbiological agencies in the degradation of steroids.—I, The cholesterol-decomposing organisms of soils, G. E. TURFITT (*Jour. Bact.*, 47 (1944), No. 6, pp. 487-493).—Cholesterol break-down in soils is shown to result from the activities of *Proactinomyces* spp., and particularly *P. erythropolis*; other bacteria, molds, and actinomycetes were found inactive. *P. aquosus* and *P. restrictus* n. spp. are described. A survey of the distribution of the species in soils indicated the relative abundance of members of this genus in fertile areas; under conditions of water-logging, extreme acidity, and lack of aeration they were found only infrequently. In the presence of CaCO<sub>3</sub> to prevent acid accumulation, the average decomposition of cholesterol in mineral salt solution by *Proactinomyces* spp. during a 2-mo. incubation at 25° C. was approximately 30 percent.

The microbiological degradation of steroids.—II, Oxidation of cholesterol by *Proactinomyces* spp., G. E. TURFITT (*Biochem. Jour.*, 38 (1944), No. 5, pp. 492-496, illus. 1).—Cholesterol degradation by *P. erythropolis* in vitro was greatly influenced by pH changes in the medium; in buffered media, its disappearance was almost complete in 4 mo. All species tested experimentally oxidized cholesterol to  $\Delta^4$ -cholesteneone in varying degrees when grown in mineral salt solution with the sterol as sole source of carbon. It is concluded that oxidation of some of the sterol is effected by the cells of the inoculum, and that actual degradation of the molecule then occurs to provide available C for continued bacterial growth. Further oxidation to  $\Delta^4$ -cholesteneone then occurs, and the process continues until all the cholesterol has disappeared. Certain fractions representing degradation products were isolated in large-scale experiments, but not yet identified. Oxidation to  $\Delta^4$ -cholesteneone also resulted when cholesterol intimately mixed with garden soil was buried in the ground for a month. In spite of evidence that *Proactinomyces* spp. are taken into the alimentary tract with certain foodstuffs, it is considered unlikely that these organisms play any appreciable role in forming  $\Delta^4$ -cholesteneone in vivo.

Fat formation in *Torulopsis lipofera*, A. KLEINZELLER (*Biochem. Jour.*, 38 (1944), No. 5, pp. 480-492, illus. 5).—*T. lipofera* was found to grow well on a medium containing 0.05 percent marmite, carbohydrate, NH<sub>4</sub>, and mineral salts, and on molasses containing K, NH<sub>4</sub>, and Mg salts. The optimum temperature was 23°-25° C., and a generation under optimum conditions required 5.25-5.50 hr. The content of fatty material in the dry yeast was 18.6-43 percent; the unsaponifiable fraction, 6.8-8.8 percent. Methods for the macro- and micro-estimation of fat and for study of fat formation in yeast are described. In the presence of glucose the respiratory quotient was higher than 1. The fat content increased linearly with time and was proportional to the glucose used. The conversion coefficient was 41-33 percent. In the absence of substrate, the respiratory quotient was lower than 1 and fat was utilized. The carbohydrate break-down and fat formation in *T. lipofera* are aerobic. Fat formation was highest at pH 5.5-6; the optimum temperature was 20°-25°; increasing concentrations of NH<sub>4</sub>Cl and urea inhibited the conversion of carbohydrate into fat. Phosphate proved essential for maximum conversion of carbohydrate to fat; iodoacetate inhibited fat formation. In the metabolism of glucose, 97 percent of the C used was accounted for; glucose was partly oxidized to CO<sub>2</sub> and partly converted to fatty acids and cell carbohydrate. Glucose, fructose, maltose, and ethanol were rapidly oxidized; saccharose, galactose, dihydroxyacetone, acetate, butyrate, methylglyoxal, and stearate more slowly; and pyruvate, lactate, acetaldehyde, propionate, glycerol, glyceraldehyde, succinate, fumarate, *dl*-malate, citrate, and gluconate were oxidized little if at all. Formation of fat from various noncarbohydrate substrates was studied, acetaldehyde alone among those tested giving a significant increase in fat formation. There are 48 references.

Penicillin.—IV, A device for placing cylinders on assay plates, M. D. REEVES and W. H. SCHMIDT. (U. S. D. A.). (*Jour. Bact.*, 49 (1945), No. 4, pp. 395-400, illus. 8).—In continuation of this series (see p. 387), the authors have constructed and here describe and illustrate a simple device said to speed up greatly this hitherto time-consuming operation; the new device places cylinders in exactly reproducible patterns on the agar plates. It has been observed that one person can place cylinders on about 12 plates per minute; three or four skilled operators are required to handle plates at the same rate if the cylinders are individually placed by means of tweezers. The apparatus has a further advantage in that the cylinders fall on the agar with about the same force and at the proper angle, thus reducing the number of leaky and otherwise improperly placed cylinders.

**Penicillin.—VI, Effect of dissociation phases of *Bacillus subtilis* on penicillin assay,** W. H. SCHMIDT, G. E. WARD, and R. D. COGHILL. (U. S. D. A.). (*Jour. Bact.*, 49 (1945), No. 4, pp. 411-412).—The observations reported in this brief note indicate clearly that assay values obtained with *B. subtilis* as the sole test organism are valid only when the unknown and standard penicillins are comprised of the same proportions of the various chemical entities known to give the "penicillin" response. Moreover, the necessity of due consideration to the phase of the test organism was apparent. It is especially noteworthy that when an organism changes from the smooth to the rough phase, the response to one penicillin increases by almost 100 percent, although the response to other penicillins remains constant. These findings also suggest that an understanding of strain and phase susceptibility may be fundamentally significant for the clinical application of antibiotic compounds such as penicillin.

**A survey of some wood-destroying and other fungi for antibacterial activity,** W. J. ROBBINS, A. HERVEY, R. W. DAVIDSON, R. MA, and W. C. ROBBINS. (U. S. D. A. et al.). (*Bul. Torrey Bot. Club*, 72 (1945), No. 2, pp. 165-190, illus. 4).—In a survey of the antibacterial activity of over 400 fungi, including over 300 wood-destroying organisms and 22 dermatophytes against *Staphylococcus aureus* and *Escherichia coli*, somewhat over 200 exhibited antibacterial activity. For a considerable proportion the inhibition of bacterial growth was apparently not caused by the H-ion concentration developed by the fungus. None was as effective as *Penicillium notatum* in producing material active against *S. aureus*, and although some inhibited *E. coli* none affected the latter as much as it affected *S. aureus*. Culture liquids active against *S. aureus* at 1-1,000 were obtained from *Pleurotus griseus* and *Irpex mollis*.

**Further studies on the antibiotic activity of lichens,** P. R. BURKHOLDER and A. W. EVANS (*Bul. Torrey Bot. Club*, 72 (1945), No. 2, pp. 157-164, illus. 2).—Continuation of these studies (E. S. R., 92, p. 770) indicated that of approximately 100 different kinds of lichens tested, 52 were inhibitory to either *Bacillus subtilis* or *Staphylococcus aureus* or both. Although gram-positive bacteria including several pathogenic types were inhibited, gram-negative ones with a few exceptions were generally not susceptible. Usnic acid, obtained from *Cladonia mitis* and *Usnea florida*, inhibited *B. subtilis*. The significance of other characteristic compounds known to be present in lichens is discussed in relation to their possible antibiotic activities.

**The antibiotic activity of extracts of Ranunculaceae,** B. C. SEEGAL and M. HOLDEN (*Science*, 101 (1945), No. 2625, pp. 413-414).—Pressed juice or steam distillate from the pressed juice of buttercup is shown to be a strong antibiotic with a wide range of activity, proving effective in vitro in inhibiting growth of selected gram-positive and gram-negative pathogenic cocci and bacilli, *Mycobacterium tuberculosis*, and three yeasts, two of which are potential human pathogens.

**Longevity of the sclerotia of mycetozoa,** P. M. GEHENIO (*Biodynamica*, 4 (1944), No. 94, pp. 359-368).—In this study of more than 100 sclerotia of *Physarum polycephalum* formed during a 3.5-yr. period from the same plasmodium, only 70 percent of those initially viable germinated after 1 yr., about 10 percent after 2 yr., and none after 3 yr. The longest time that any of them remained 100 percent viable was about 17 mo.; in some cases 40 to 50 percent of the germinability was lost during the first 3 mo. of storage. Sclerotia produced under apparently identical conditions differed widely both in initial viability and in longevity. The sclerotia formed during the last 6 mo. of the 3.5-yr. period during which the plasmodium was maintained in the laboratory exhibited a definitely lower initial viability and a reduced longevity; the longevity of those formed prior to that time cannot be certainly correlated with the "age" of the culture from which they originated.

The lethal action of desiccation on the sclerotia of mycetozoa, B. J. LUYET and P. M. GEHENIO (*Biodynamica*, 4 (1944), No. 95, pp. 369-375, illus. 1).—The sclerotia of *Physarum polycephalum* suffered a decrease or complete loss of viability when dehydrated in a vacuum or by exposure for several days over desiccants. The curve of decrease in viability did not parallel that of the decrease in water content. After a certain degree of dehydration was attained a sclerotium continued to lose its viability when left in the desiccator, though no further desiccation occurred.

Relationship between pathogenicity and pH tolerance of microorganisms, J. M. LEISE and L. H. JAMES. (Univ. Md.). (*Science*, 101 (1945), No. 2626, pp. 437-438).—An alkaline medium (Sabouraud's dextrose or maltose agar at pH 10.5) proved selective for dermatophytes in the presence of the rapidly growing saprophytic fungi and was used to isolate dermatophytes from mixed cultures and leather. Virulent dysentery bacteria grew in media of alkaline pH, whereas nonvirulent strains were greatly or completely inhibited. It is strongly indicated that the pathogenicity may be related to pH tolerance, and it is suggested that this relationship may be explained by the presence of a trypsinlike enzyme or enzyme system, while the loss of pathogenicity is associated with a loss or weakening of this enzyme system.

A guide and key to the aquatic plants of the southeastern United States, D. E. EYLES, J. L. ROBERTSON, JR., and G. W. JEX (*U. S. Pub. Health Serv., Pub. Health Bul.* 286 (1944), pp. 151+, about 300 illus.).—"The purpose of this compilation is to enable workers in the field, with little knowledge of botany, to identify at least generically those fresh-water plants with which mosquito breeding is associated."

Miscellaneous notes on nomenclature of United States trees, E. L. LITTLE, JR. (U. S. D. A.). (*Amer. Midland Nat.*, 33 (1945), No. 2, pp. 495-513).—This includes some new taxonomy.

Studies in the Sapotaceae.—I, The North American species of *Chrysophyllum*, A. CRONQUIST (*Bul. Torrey Bot. Club*, 72 (1945), No. 2, pp. 191-204).—A taxonomic study, including a key to the species and new taxonomy, carried out under the auspices of the Chicle Development Company.

The plant associations of the Carson Desert region, western Nevada, W. D. BILLINGS. (Univ. Nev.). (*Butler Univ. Bot. Studies*, 7 (1945), Papers 1-13, pp. 89-123, illus. 4).—"Except for scattered references of a generalized nature, little is recorded concerning the structure of vegetation in the arid and semi-arid portions of the western Great Basin. The delineation of the associations of a part of this area and their particular environments is the prime function of this paper."

Plant succession on abandoned farm land in the vicinity of New Orleans, Louisiana, J. BONCK and W. T. PENFOUND (*Amer. Midland Nat.*, 33 (1945), No. 2, pp. 520-529, illus. 4).—Plant succession on this abandoned land along the Mississippi River proceeded through the annual weed, perennial weed, and shrub stages, details of which are described. By the end of the first summer after abandonment, fields of each group closely resembled one another in the cover of summer grasses. Initiation of the perennial weed stage occurred during the second growing season after cultivation; by the second summer *Solidago hirsutissima* was the predominating species. From the second year onward shrubs increased in size and density until about the tenth year, when the shrub stage became established. A field abandoned for 25 yr. had the appearance of a young forest with tall wax myrtle shrubs forming a dense canopy and a relatively sparse herbaceous cover. The final stage of plant succession in this locality is unknown, although *Quercus virginiana* is believed to be an important component. Certain genera such as *Syntherisma*, *Solidago*, and *Andropogon*—important constituents of successional plant communities in the Southeastern States generally—are also prominent species on abandoned farm land in the New Orleans area.

Preliminary investigations into the function of the endotrophic mycorrhiza of *Theobroma cacao* L., D. H. LAYCOCK (*Trop. Agr. [Trinidad]*, 22 (1945), No. 4, pp. 77-80, illus. 4).—The author describes a phycomycetous endotrophic mycorrhizal association in cacao roots from Yaguaraparo in Venezuela, and from Trinidad and Tobago. All efforts to isolate it in pure culture failed. Studies of the differences in mycorrhizal density in "good" and "bad" cacao plots suggested that the mycorrhiza is more abundant in the latter. In a pot test cacao seedlings germinated and grew equally well either with or without mycorrhiza—at least to 15 weeks of age. The presence of a similar mycorrhizal fungus in soil not in cacao in recent years suggests the possibility that the cacao fungus may be associated with the roots of other plants. No indication has yet been found that the mycorrhiza is of any outstanding physiological importance in the growth of cacao.

Temperature-growth relations of the roots and hypocotyls of cotton seedlings, C. H. ARNDT. (S. C. Expt. Sta. coop. U. S. D. A.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 200-220, illus. 6).—The cotton seedlings under study were grown from acid-delinted seed in darkness on an agar medium in test tubes at eight temperatures from 18° to 39° C. A germination percentage greater than 90 was obtained within 7 days at all temperatures except 39°. Discernible protrusion of the radicles occurred most promptly at 33°. At 39° the germination percentage was 50 after 1 day and 80 after 2 days, following which there was no further increase. The optimum temperature for prompt germination was apparently between 33° and 36°; the minimum for any germination was below 18° and the maximum somewhat above 39°. The temperature minimum for growth of either primary roots or hypocotyls was below 18° and the maximum for any growth above 39°, but the latter temperature soon induced heat injury. For each temperature the detailed data on elongation are presented in graphs. The earliest emergence of secondary roots occurred at 33° and 36°, but after 7 days their total length was greatest at 30° and they were most numerous at 27°. The optimum for early emergence of cotyledons from the testas was about 27°. In the 7-day period dry weight and organic matter decreased and ash contents increased at all temperatures, the loss being greatest at 36°. Further results are presented in great detail.

The findings indicate three striking features of temperature relations believed to have hitherto been unrecorded for seedlings of any species: (1) The temperature optimum for elongation of both primary roots and hypocotyls shifted with time and growth. For elongation of primary roots, the shift was downward from 33° to 36° at the start to about 27° after 3-4 days' growth; for elongation of hypocotyls the shift was in the opposite direction but not as great, being from about 33° at the start to about 36° after about 4-5 days' growth. (2) Although the optimum temperatures for elongation of primary roots and hypocotyls were nearly the same (about 33°) for a short time after germination began, they differed by as much as 9° when the primary roots had extended downward about 100 mm. and the hypocotyls had extended upward about 160 mm. If this observation should be found to apply to cotton seedlings in the field, it would indicate that young cotton plants may be remarkably well adapted to temperature differences between air and various depths of soil by virtue of well-timed shifts in the temperature optimums for elongation of primary roots and of tops. (3) According to the several criteria, 30° was favorable for increase in weight and for the development of cotyledons and secondary roots but relatively less favorable for the most rapid elongation of the hypocotyls and primary roots of these cotton seedlings when about a week old. This characteristic may represent some important physiological feature worthy of special study.

A simplified recording potentiometer, R. H. WALLACE. (Univ. Conn.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 258-266, illus. 6).—The instrument described

and fully illustrated is fundamentally a self-balancing potentiometer controlled by radio tubes. It differs from the earlier model constructed by the author<sup>2</sup> in being much more sensitive, stable, and compact, and particularly in its mechanical reliability. All parts used in its construction are standard, and only a minimum amount of machining is necessary. The details of the activating mechanism, the mechanical construction, and the operation of the instrument are described.

The B vitamin content of buds and shoots of some common trees, P. R. BURKHOLDER and I. McVEIGH (*Plant Physiol.*, 20 (1945), No. 2, pp. 276-282, illus. 2).—Microbiological assays are reported for thiamine, riboflavin, pyridoxine, niacin, inositol, biotin, pantothenic acid, and vitamin B<sub>c</sub> occurring in the buds and leaves of 18 kinds of woody plants. The possible significance of the data for studies on growth and for problems in the conservation of wild life is briefly discussed.

Effect of carbon dioxide on absorption of water and nutrients by roots, H. T. CHANG and W. E. LOOMIS. (Iowa Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 221-232).—Water absorption by roots of wheat, maize, and rice growing in water cultures was reduced 14 to 50 percent by bubbling CO<sub>2</sub> through the solutions for 10 min. out of each hour. Bubbling air through cultures at the same intervals increased water absorption 9 percent; in one test, bubbling with N increased absorption by 13 percent. Adding H<sub>2</sub>SO<sub>4</sub> to bring the solutions to the pH reached with CO<sub>2</sub> had no effect on water absorption. None of the plants was visibly injured by treatments lasting 36 hr. CO<sub>2</sub> treatments reduced the absorption of five nutrient elements in the order K>N>P>Ca>Mg. Ca and Mg absorption was reduced about as much as water absorption; K was excreted from the roots of many of the plants treated with CO<sub>2</sub>; N and P absorption were intermediately affected. It is suggested that the toxic effect of CO<sub>2</sub> on plant protoplasm is associated with its specific ability to change the internal pH of cells and to form H-bond compounds with proteins. Reported maximum CO<sub>2</sub> concentrations in field soils rise above toxic levels, and CO<sub>2</sub> toxicity should be included with O<sub>2</sub> deficiency as a factor affecting plant development in poorly aerated soils. Because of the importance of roots in raising soil CO<sub>2</sub>, this gas may be a factor in root competition, particularly in the deeper layers of heavy soils. There are 26 references.

Aluminum toxicity: Microchemical tests for inorganically and organically bound phosphorus, K. E. WRIGHT. (R. I. Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 310-312).—Application of the microchemical tests described to fresh material of barley plants grown in culture solutions with and without Al showed abundant inorganically bound P in the roots in contact with Al, but little or none in those from culture solutions lacking it. This finding indicates a possible combination of phosphate with Al in those plants where Al was supplied in the culture solution.

Translocation of carbohydrates in maize, W. E. LOOMIS. (Iowa State Col.). (*Science*, 101 (1945), No. 2625, pp. 398-400).—According to this address of the retiring president of the American Society of Plant Physiologists in September 1944, corn pith is found to exhibit a changing sugar content with changing sugar movement in the phloem which would not be predicted from the present picture of the morphology of the vascular bundle. By all tests of changing concentration, sucrose is the important carbohydrate of translocation in corn, but interconversion of the several sugars is too rapid to permit a final conclusion. A hypothesis of translocation in corn must not only account for movement against an osmotic gradient, but against gradients of each of the substances which might possibly be translocated. Such secretory translocation certainly occurs between the leaf

<sup>2</sup> *Plant Physiol.*, 12 (1937), No. 2, pp. 487-498, illus. 7.

mesophyll and the phloem and probably along the phloem itself. Translocation in corn is polarized out of the leaf, out of the xylem, and toward the developing fruit. Polarized translocation out of the leaf is established during the later stages of tissue differentiation; polarized translocation toward the fruit is established in the early phases of embryo development and does not develop in the absence of pollination. Unpublished and general evidence indicates that polarized translocation is a factor in many correlation and inhibition reactions of plants generally, as well as of maize.

**Respiration and internal gas content of injured sweet-potato roots,** T. M. WHITEMAN and H. A. SCHOMER. (U. S. D. A.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 171-182, illus. 3).—The respiration studies reported for various plant parts are believed to have dealt only with apparent respiration; from the results it is concluded that addition of the extracted internal CO<sub>2</sub> to the apparent respiration values gave the true respiration of the product. The increase in the apparent respiratory rates of both sealed and nonsealed wounded sweetpotato roots immediately following wounding was due entirely to wound stimulation. When the CO<sub>2</sub> of the internal gases was added to that of the apparent respiration, the true respiration value was found to be the same for both the sealed and nonsealed lots. The increase in internal CO<sub>2</sub> in the sealed lots of sweetpotatoes was due entirely to wound stimulation. The apparent respiration of wounded, nonsealed roots was somewhat higher than the true respiration, due to escape of some of the CO<sub>2</sub> present before wounding. In the sealed lots a large amount of the CO<sub>2</sub> that is rapidly formed after wounding went into solution as H<sub>2</sub>CO<sub>3</sub> or combined in some other form with cell sap constituents, since the wounded area was sealed over to prevent its escape through this channel. To obtain a true measurement of the respiratory rate of any plant organ or tissue the apparent rate should be corrected to include any change between the initial and the final internal content of CO<sub>2</sub>.

**The effect of reduced light intensity on the aerial and subterranean parts of the European bindweed,** A. L. BAKKE and W. G. GAESSLER. (Iowa Expt. Sta. coop. U. S. D. A.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 246-257, illus. 2).—Five habitats with varying light intensities were established by placing cloth-covered chambers 4 X 6 X 4 ft. in a heavily infested area from July 1937 until the end of the growing season, 1940. The maximum light intensities of these chambers were 3,400, 1,150, 650, less than 1, and—control—10,000 ft.-c., respectively. Daily light, temperatures, and evaporation readings were taken of three habitats during 1937. Measurements of the thickness of the leaves under the different light intensities were (1) 3,400 ft.-c., 0.220 mm.; (2) 1,150 ft.-c., 0.210 mm.; (3) 650 ft.-c., 0.190 mm.; (4) 1 ft.-c., 0.160 mm.; and (5) 10,000 ft.-c., 0.334 mm. Measurements of the leaf area were (1) 3,400 ft.-c., 8.15 sq. cm.; (2) 1,150 ft.-c., 7.15 sq. cm.; (3) 650 ft.-c., 3.76 sq. cm.; (4) 1 ft.-c., 0.69 sq. cm.; and (5) 10,000 ft.-c., 3.21 sq. cm. The shelter (3) covered with drill produced at the end of 1937 season 1,418.5 gm. of green bindweed material; at the end of 1940 there was 0.7 gm. present. The average amount of root material per 24 cu. ft. at the end of 1940 for the first 3 ft. for the control was 200 gm. (green weight), percentage total available carbohydrates 18.79, and amount of total available carbohydrates 7.65 gm. (dry weight). For the drill-covered area the average amount of root material for the first 3 ft. was 0.74 gm., percentage total available carbohydrates 27.74, and total carbohydrates 0.050 gm. A successful smother or competitive crop when used to eradicate the European bindweed is thus fundamentally a process of light restriction. Sufficient shade must be produced early in the development of the plant which predominates. There are 28 references.

**Effect of copper and zinc deficiencies on the photosynthetic activity of the foliage of young tung trees,** A. J. LOUSTALOT, F. W. BURROWS, S. G. GILBERT,

and A. NASON. (U. S. D. A.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 283-288).—In leaves of young tung trees, Cu and Zn deficiencies were definitely associated with a reduced photosynthesis. The amount of reduction was less for Zn than for Cu deficiencies as they occurred in this study. There was a highly significant reduction in CO<sub>2</sub> assimilation even with normal-appearing leaves on deficient plants. The highest photosynthetic rates in the fall occurred about mid-October and were associated with favorable weather. As a rule the rates were higher in the mornings than in the afternoons.

Iron in the leaves and chloroplasts of some plants in relation to their chlorophyll content, L. JACOBSON. (Univ. Calif.). (*Plant Physiol.*, 20 (1945), No. 2, pp. 233-245, illus. 11).—The active Fe concept of Oserkowsky (E. S. R., 69, p. 637) was found valid for corn and tobacco leaves as well as for pear leaves. A proportionality existed between total Fe and chlorophyll content in the leaves of the plants studied. Before chlorophyll can occur the total Fe content of the leaf must exceed a certain minimum level; this is determined by the species and the growth conditions. Thorough washing of the leaves with dilute acid was found a prerequisite for valid quantitative analyses for Fe; neglect of this point may lead to highly erroneous results. In tobacco, the active Fe is localized solely in the chloroplasts, but other fractions—both acid-soluble and acid-insoluble—are also present. Fe is present in the chlorophyll protein complex prepared by (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> precipitation from both corn and tobacco leaves. There are 20 references.

The interrelationship of nitrogen supply and photoperiod on the flowering, growth, and stem anatomy of certain long and short day plants, A. P. WITHEROW. (Ind. Expt. Sta.). (*Butler Univ. Bot. Studies*, 7 (1945), Papers 1-13, pp. 40-64, illus. 6).—The plant material studied consisted of *Scabiosa atropurpurea* and *Spinacia oleracea* (long-day plants); and *Tithonia speciosa*, *Soja max*, *Salvia splendens*, and *Xanthium pensylvanicum* (short-day plants). External N supply was not found a determining factor in floral initiation as are photoperiod and temperature, but it did alter the time of appearance of macroscopic buds and flowering in some species—especially if small vegetative plants without large amounts of reserve N were used. The direction of the photoperiod effect on total dry weight, percentage of dry matter, top-root ratio, or height response was not usually altered by the amount of N supplied. Given abundant N, the plants were heavier, taller, and had a lower percentage of dry matter than those with limited supply. Plants on a long photoperiod were usually taller than those with the same N supply but on short photoperiod. Flowering plants usually had a higher percentage of dry matter, higher top-root ratio, and in many cases greater total dry weight than vegetative plants. Limitation of the N supply markedly altered the anatomical response of the stems. When N was limited, a reduction in cell size and an increase in cell wall thickness, with greater lignification, occurred in the long photoperiod in the species investigated, whether the plants were in the flowering or vegetative condition; in the short photoperiod, results varied. *Salvia* plants with abundant N had heavier walled and smaller cells; the reverse was true for soybean. A smaller proportion of phloem to xylem cells was usually present in the flowering as compared to the vegetative stems. There was also a greater proportion of undifferentiated cells in the vegetative stems.

Growth and nutrient responses of Little Turkish tobacco to long and short photoperiods, R. A. DENNISON (*Plant Physiol.*, 20 (1945), No. 2, pp. 183-199, illus. 3).—Growing this variety in 6.5- and 14-hr. day lengths, respectively, with constant salt and water supply in gravel culture showed that stem elongation in the short-day group is retarded in all phases of growth. Internodes are shorter and average area per leaf is smaller on short day, but the number of leaves is greater. Leaf surface area increases at a higher rate in the long-day group of

plants until the time of flowering. During flowering, the aggregate foliar surface increases more rapidly in short-day and finally surpasses the total leaf surface of long-day plants. The rate of root growth is greatly retarded in the short-day plants during the stage of rapid stem elongation. The long-day group produces a greater total dry weight; plants of the short-day group remain about 8 days behind the long-day group in growth. Total water consumption is similar in the two groups. Because of the smaller size of short-day plants, the amount of water consumed per gram of dry weight of tissue produced (water requirement) is much greater. Water consumption per unit leaf area rises sharply during the blossoming and early fruiting phases in both groups, but the rise is about twice as great in the long-day group. Carbohydrates of the short-day group are relatively immobile, tending to accumulate in the leaves; N tends to accumulate in stems of both groups at the expense of the leaves in later developmental stages. There is a progressive increase in total ash content with age in both groups, but during the final phase of growth short-day plants increase their ash at a higher rate. Inflorescences in long-day are more than twice as large and the size and number of flowers is greater than in the short-day plants. Formatively, short day leads to production of more but smaller vegetative elements, poorer root growth, and fewer reproductive elements. There are 28 references.

A study of pollen grains of thirty-two species of grasses, F. GEISLER (*Buller Univ. Bot. Studies*, 7 (1945), *Papers 1-13*, pp. 65-73, illus. 2).—In the present study of 32 species the author attempted to find some means of differentiating among the various genera of grasses representative of ecological factors, with special emphasis on diagnostic differences among groups of typical prairie and typical aquatic grasses. Four groups were considered, representing (1) aquatic, (2) wet lowland, (3) mesophytic, and (4) prairie habitats. Drawings were made of each species studied, and a size frequency curve was constructed. Most of the species appeared to have a single distinct high peak in the size-frequency which, unfortunately, proved identical for different species. The modal peak for (1) was 25 $\mu$ ; the size range, 19 $\mu$ -50 $\mu$ . *Zizania aquatica* was the only member of (1) with pollen size greater than 35 $\mu$ , and thus overlapped with the prairie group; it seemed to have a thinner cell wall than pollens of the same size from prairie species. The modal peak for (2) and (3) centered around 31 $\mu$ ; size range for (2) was 25 $\mu$ -46 $\mu$  and for (3) 24 $\mu$ . Size range for (4) was 21 $\mu$ -50 $\mu$ , with a modal peak at 39 $\mu$ . As a whole the pollens of prairie grasses were markedly larger than those of other ecological groups, but since *Z. aquatica* had pollen similar to that of *Andropogon* and *Sorghastrum* spp. it is practically impossible to separate prairie grasses from the aquatic species on the basis of pollen-size differences.

The anatomy of peach and cherry phloem, H. SCHNEIDER (Univ. Calif.). (*Bul. Torrey Bot. Club*, 72 (1945), No. 2, pp. 137-156, illus. 25).—During a study of the effect of the buckskin virus on the anatomy of peach and cherry, little was found in the literature concerning the phloem of peach. Accordingly, a study was made of the development of the primary and secondary phloem in the healthy peach, with some attention to the secondary phloem of healthy cherry. The literature on the anatomy of the peach is also discussed.

## GENETICS

A list of chromosome numbers in higher plants.—II, *Menispermaceae to Verbenaceae*, W. M. BOWDEN (*Amer. Jour. Bot.*, 32 (1945), No. 4, pp. 191-201, illus. 84).—In the present paper (E. S. R., 93, p. 25), the results are given of cytological examinations of 222 collections of 179 species of angiosperms and 2 collections of 2 species of gymnosperms; these were distributed in 80 genera of 48 families.

**Effects of ionizing radiations on chromosomes,** D. G. CATCHESIDE (*Biol. Rev. Cambridge Phil. Soc.*, 20 (1945), No. 1, pp. 14-28, illus. 11)—"When nuclei are irradiated by X-rays, neutrons, or radioactive radiations, either clumping of the chromosomes or breaks and structural rearrangements of the chromosomes are observed at metaphase according to the division stage, respectively late prophase and metaphase or resting stage and early prophase, reached at the time of radiation. Chromosome structural changes are induced at the resting stage, chromatid at early prophase. The number of primary breaks induced greatly exceeds the total number of breaks observed at the subsequent metaphase. The majority of the breaks restitute after being open for a few minutes. Exchanges are possible during the time the breaks are open. If the dose of radiation is given at a high intensity, in a short time, so that all the primary breaks coexist, the yield of X-ray-induced exchanges is proportional to the square of the dose. If the dose is given at a lower intensity, in a longer time, some restitution of the earlier formed breaks occurs before the later ones are formed, and the yield of exchanges is then proportional to a lower power of the dose. Only breaks with an initial separation of not more than  $1\mu$  have an appreciable chance of taking part in an exchange. In neutron and  $\alpha$ -ray experiments, in which a small number of ionizing particles cross the nucleus, the yield of exchanges is linearly proportional to dose and independent of intensity. Thus the majority of the exchanges are between pairs of breaks produced simultaneously by the same ionizing particle. An ionizing particle may break both chromatids of a split chromosome at the same locus and an isochromatid break usually results. A proportion of the primary chromatid breaks are unjoinable; hence a proportion of interchanges are incomplete, a proportion of isochromatid breaks show nonunion, and a proportion of breaks not taking part in exchanges persist as visible chromatid breaks instead of restituting. The number of primary chromatid breaks can be inferred and is found to differ for different radiations. A proton or an  $\alpha$ -ray traversing a chromatid has almost unit probability of causing a break. An electron is likely to cause a break only if the last  $0.3\mu$  of its ionized track traverses the chromatid; hence a minimum of 15-20 ionizations must be produced in a chromatid of diameter  $0.1\mu$  for the breakage probability to approach unity. The relative efficiencies of different wavelengths and types of radiation can be explained on this basis."

**Quantitative irradiation experiments with *Neurospora crassa*, I, II** (*Amer. Jour. Bot.*, 32 (1945), No. 4, pp. 218-226, illus. 1; pp. 226-235, illus. 10).

I. **Experiments with X-rays,** E. R. Sansome, M. Demerec, and A. Hollaender.—X-radiation produced variants shown by genetic analysis to be mutants. The increase in mutation rate with increase in energy followed a straight-line relationship at low dosages and reached 78.5 percent at 126,000 r. Increase in intensity led to increase in mutation rate. Phenotypic normal and mutant cultures obtained from irradiated spores often exhibited partial sterility when crossed with a standard wild type, but this was more frequent in phenotypic mutants than in phenotypic normals. Partial sterility is believed to result from chromosomal aberration. Analyses of the sterility and mutation rates at different dosages and intensities indicated that there are two types of mutants—one caused by chromosome aberration and the other not; the latter, however, may consist partly or entirely of changes potentially capable of being associated with aberrations.

II. **Ultraviolet irradiation,** A. Hollaender, E. R. Sansome, E. Zimmer, and M. Demerec.—The wavelength found most effective in inducing mutations in *Neurospora* was 2,650. At 2,280 the killing rates were high and the mutation rates low, whereas at 2,967 both rates were low except with very high dosages; at 2,650 the rates increased with dosage up to a maximum and then decreased. Genetic analysis indicated that 24 out of 60 mutants were multiple. The rate-dosage curve

and the high coincidence of mutations are believed to indicate heterogeneity in the treatment given to the spores and in the response of the spores to treatment. The hypothesis that spores differ in their capacity to give a chromosome rather than a chromatid response to ultraviolet radiation proved insufficient to explain the findings, although there was evidence that both chromatid and chromosome effects occur. Sterility in association with the mutants was much less frequent in the ultraviolet than in the X-ray mutants. The ultraviolet results are discussed in relation to those from X-rays, and it is suggested that the effects of the former are localized, whereas the latter are diversified, including chromosome breaks and rearrangements. The X-ray effects may include those of the type induced by ultraviolet treatment, but this cannot as yet be determined because it has been impossible to distinguish between the different types of mutants. There are 19 references.

The production and characterization of ultraviolet-induced mutations in *Aspergillus terreus*.—III. Biochemical characteristics of the mutations, L. B. LOCKWOOD, K. B. RAPER, A. J. MOYER, and R. D. COGHILL. (U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 4, pp. 214-217, illus. 5).—Following the previous studies (E. S. R., 93, p. 266), 9 types of biochemical and cultural response were observed from 217 strains of *A. terreus* derived from irradiated conidia. Among 76 morphologically unchanged strains were 59 that appeared to be unaltered biochemically and 13 producing more itaconic acid than the parent strain and 4 producing none. Among the 141 strains that were obviously altered morphologically were 42 that did not appear to be altered biochemically, 88 producing little acid, and 11 failing to grow on the test medium; none of these strains produced more itaconic acid than the parent strain. Considerable nonacid unsaturated material was produced by 15 strains, and 17 apparently produced no acid other than itaconic. The distributions of strains—plotted in terms of total acid produced, itaconic acid produced, efficiency of conversion of glucose to itaconic acid, mycelial weights, and neutral nonreducing substances produced—are presented.

Studies on colchicine-induced autotetraploid barley, III, IV, S.-L. CHEN and P. S. TANG (*Amer. Jour. Bot.*, 32 (1945), No. 4, pp. 177-179, illus. 1; pp. 180-181, illus. 1).

III. Physiological studies.—In continuation (E. S. R., 93, p. 246), the rates of O<sub>2</sub> consumption and CO<sub>2</sub> production by germinating seeds of 4n barley were found to be lower than those of the normal diploids. Tetraploid barley seedlings transpired at a lower rate than the diploids whether expressed on a leaf-area or a dry-weight basis. Tetraploid barley cells possessed a suction pressure corresponding to 0.875 m and a maximum osmotic pressure of 1.1 m sucrose solution; for diploids the corresponding figures were 0.75 m and 0.9 m, respectively. Placed on moist filter paper, the seeds of 4n barley imbibed more water per unit dry weight than those of the diploids; they also contained more protein N, lipid substance, and ash than seeds of the diploids. On the other hand, the latter contained more N-free matter, presumably carbohydrates, than the former.

IV. Enzyme activities.—The catalase activities of the 2n and 4n barley seeds followed a first order reaction curve, the constants of the reaction being k' = 3.23 × 10<sup>-2</sup> for 2n seeds and k' = 2.75 × 10<sup>-2</sup> for the 4n seeds. The rate of decomposition of H<sub>2</sub>O<sub>2</sub> by the 4n seeds was 2.5 times faster than that of the 2n seeds. The malt diastase activity of sprouted seeds of 4n barley was about twice that of the 2n seeds as measured by the amount of extract necessary to reduce a given amount of Fehling's solution in a given time. Extracts from the leaves of 2n and 4n seedlings were both without effect on succinic, l-malic, lactic, and citric acids and on Ca-glycerophosphate, but they all effected a reduction of methylene blue in the presence of ethyl alcohol, glycine, dl-alanine, glutamic acid, cysteine, and l-cystine. The rate of reduction was in general faster in the presence of 2n than 4n extracts.

Effects of phosphorus, nitrogen, and soil moisture on top-root ratios of inbred and hybrid maize, D. B. SHANK. (Iowa Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 70 (1945), No. 11, pp. 365-377).—Top-root ratios of corn inbreds and hybrids, grown 6 to 8 weeks in the greenhouse, increased with P concentration as the P supply rose from definitely limiting to enough for good plant growth, but did not increase as rapidly (measured arithmetically) for hybrids or their low-ratio parents as for their high-ratio parents. Hybrids and their low-ratio parents did not differ in rate of ratio increase. As either N or soil moisture concentrations were raised from those definitely limiting good growth, top-root ratios increased, but no differential rate of arithmetic increase was found between hybrids and either their high- or low-ratio parents.

Tetraploids induced in rice by temperature and colchicine treatments, H. M. BEACHELL and J. W. JONES. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 3, pp. 165-175, illus. 3).—Twenty-six tetraploid and 8 tetraploid-sector plants were obtained at Beaumont, Tex., from seed produced on panicles of Blue Rose and Caloro exposed, for certain periods, to low and high temperatures or a combination of both within 19 to 24 hr. after blooming. Blue Rose seed soaked in colchicine solutions produced 3 tetraploid plants in the second generation after treatment. Shoots of a haploid plant, untreated and treated in colchicine solutions, produced diploid and diploid-sector plants. There were 3 cases in which haploid plants produced some seed. Tetraploid and triploid Blue Rose and Caloro plants were not as tall, tillered less, were less fertile, and had coarser leaves and larger florets and seeds than diploid plants of these varieties. Haploid plants were completely sterile and were shorter, tillered much more, and had finer leaves and culms and smaller florets than the diploids. Haploid and triploid plants that arose as mutations in varieties and hybrids are also reported.

Inheritance of the "bolter" condition in the potato, G. P. CARSON and H. W. HOWARD (*Nature* [London], 154 (1944), No. 3922, p. 829).—Following a description of the bolter condition in potatoes and a brief summary of certain crosses, it is stated that "since a series of intermediates between the normal and bolter type occur, and since it is known that maturity, flowering, and stolon development are influenced strongly by the length of day, it is possible that the bolter condition arises through the mutation of the gene or genes governing the photoperiodic reaction."

[Conference on gene action in micro-organisms] (*Ann. Missouri Bot. Gard.*, 32 (1945), No. 2, pp. 107-249, illus. 31).—The following papers are included: Mendelian and Cytoplasmic Inheritance in Yeasts, by C. C. Lindegren (pp. 107-123); Biochemical Genetics of *Neurospora*, by E. L. Tatum and G. W. Beadle (pp. 125-129); Genetic Aspects of Changes in *Staphylococcus aureus* Producing Strains Resistant to Various Concentrations of Penicillin, by M. Demerec (pp. 131-138); The Physiology and Genetic Significance of Enzymatic Adaptation, by S. Spiegelman (pp. 139-163); The Mechanism of Radiation Effects and the Use of Radiation for the Production of Mutations With Improved Fermentation, by A. Hollaender (pp. 165-178); The Influence of Nucleic Acid on Dehydrogenase Systems—a Contribution to the Problem of Gene Mechanism, by J. P. Greenstein and H. W. Chalkley (pp. 179-185); Genetic Aspects of Virulence in Bacteria and Viruses, by J. W. Gowen (pp. 187-211) (Iowa Expt. Sta.); Gene Action in Paramecium, by T. M. Sonneborn (pp. 213-221); Spontaneous Mutations of Bacteria, by M. Delbrück (pp. 223-233); Genetics of Bacterium-Bacterial Virus Relationship, by S. E. Luria (pp. 235-242); and Genetics as a Tool for Studying Gene Structure, by S. Emerson (pp. 243-249).

The genetics of bryophytes, II, C. E. ALLEN. (Univ. Wis.). (*Bot. Rev.*, 11 (1945), No. 5, pp. 260-287).—This review (107 references) attempts to cover,

so far as present conditions allow, the published work which has appeared since the paper previously presented.\*

Frequency of aborted pollen grains and microcytes in guayule, *Parthenium argentatum* Gray, L. POWERS and E J. GARDNER. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 3, pp. 184-193).—Guayule has considerable genetic variability in percentage of aborted pollen grains and frequency of microcytes. Both heterogeneity and heterozygosity were found important factors in determining variability. For mean percentage of aborted pollen grains, genetic variability is great within classes based on method of reproduction, chromosome number, location, type of plant, region of Trans-Pecos Area of Texas, and collection. The same was not true for mean number of microcytes in respect to amphimixis, the 36+ and the 54± chromosome groups, location and region of Trans-Pecos Area of Texas, but was true as to facultative apomixis, the 72± chromosome group, type of plant, and location. Selection as a method of breeding evidently would be very effective in respect to both characters.

Artificial insemination of livestock, D. S. WISHART (*Austral. Vet. Jour.*, 20 (1944), No. 6, pp. 347-354).—This article deals mainly with the collection, storage, and transportation of semen and its use in artificial insemination of mares, cattle, sheep, and swine.

Artificial insemination, with special reference to Scottish conditions, J. A. HENDERSON (*Vet. Rec.*, 56 (1944), No. 25, pp. 207-209).—General directions for artificial insemination of cattle with reference to its use in cooperative insemination societies in America, Denmark, and other countries, with a formula for the semen dilutor.

A new sex-linked defect in cattle, E. L. MORRILL (*Jour. Hered.*, 36 (1945), No. 3, pp. 81-82).—Affected ♂♂ have an extra toe on each front foot. At birth the calves function normally, but when they weigh 400-500 lb. they have trouble in locomotion and at 600-800 lb. they become tender and lame. ♀♀ were unaffected. The foot defect occurred in all the male progeny of a Hereford cow and her daughters over about a 6-yr. period. The heifers were all normal. The condition appeared to be dominant in ♂♂ and recessive in ♀♀, but the numbers were small.

Many causes for breeding troubles in cows, W. L. BOYN (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 2 (1945), No. 3, pp. 13-14, illus. 1).—Reduced fertility in heifers and cows may be caused by faulty diet and failure to come into heat, resulting in part from retained corpora lutea. Heat may frequently be induced by injections of stilbestrol. Another cause of low fertility may be abortion from Bang's disease.

The sex ratio and multiple births in sheep, I. JOHANSSON and A. HANSSON (*Lantbr. Högsk. Ann. [Uppsala]*, 11 (1943), pp. 145-171, illus. 4).—The average sex ratio of 58,381 lambs born in 1925-42 in four breeds—Oxford Down, Shropshire, Cheviot, and two strains of Swedish Landrace—in Sweden was  $49.58 \pm 0.174$ . The coefficient of regression of sex ratio on number of lambs per birth was  $-0.569$ , and the value of  $r$  was  $-0.791$ . The frequency of the same sexed combinations in multiple births did not give evidence of monozygotic twinning since the number of the same sexed pairs was smaller than the number of opposite sexed pairs. The ratio of triplet births to twin births was 1 : 19.5 and of quadruplet births to triplet births 1 : 22.5. The frequency of multiple births varies with the age and body weight of the ewe and with the season of mating. The highest average litter size occurred when ewes were 4 to 7 yr. of age. Matings in the middle of the breeding season produced the largest litters. The total variance in size of single litters was probably 10 to 15 percent hereditary. Selection for

\* Bot. Rev., 1 (1935), No. 8, pp. 269-291.

higher fertility in ewes should be based on the average litter size rather than single records. Selection of rams through progeny should have but a slight effect on litter size.

**Inheritance of coat color in swine.**—I. General survey of major color variations in swine, H. O. HETZER. (U. S. D. A.). (*Jour. Hered.*, 36 (1945), No. 4, pp. 121-128).—A summary is given of what, on the basis of different workers' results and the author's findings, seem the most likely to be essential facts about the inheritance of the major color variations in swine. These are discussed under the general headings of "tortoise-shell" patterns; white patterns—self white, the white of Mangalitza, belted patterns, and white points; red of Tamworth and Duroc-Jersey; and the wild hog. A list of 48 references is included.

The role of heredity in response to a drug, as demonstrated by the experimental molt of rabbits induced by toxic thallium compounds, N. A. ILJIN (*Jour. Hered.*, 36 (1945), No. 3, pp. 85-91, illus. 3).—The general experimental molt in the rabbit may be induced by monovalent or trivalent compounds of thallium, as induced in sheep (E. S. R., 77, p. 398). The monovalent compounds are more toxic, and there is great variation in the toxicity of the trivalent compounds. Within 2 or 3 days a diminution of the root strength of the hairs of Angora rabbits was noted after thallium administration. Diminution of the root strength increased by degrees, and on the fourteenth to seventeenth days after administration of thallium the wool covering became detached. A new and uniform character of the wool was described. This occurred on the Angora rabbits, but neither the denuding nor new wool growth was produced on short-haired rabbits of several colors. The mode of reaction in over 800 Angora rabbits showed the molting to occur on all types of long-haired animals.

Additional data on sex control in rabbits, J. H. QUISENBERRY. (Tex. A. and M. Col.). (*Jour. Hered.*, 36 (1945), No. 5, p. 160).—No significant effects were noted in the sex ratio of rabbits as a result of douching the dams with 3 percent lactic acid or 5 percent sodium bicarbonate before fertilization (E. S. R., 84, p. 748).

The X-bivalent of the golden hamster, L. HUSTED, J. T. HOPKINS, JR., and M. B. MOORE, JR. (*Jour. Hered.*, 36 (1945), No. 3, pp. 93-96, illus. 1).—The testes of one and the ovaries of several animals were removed, sectioned, and stained for determination of the chromosome behavior. Immature follicles contain chromosomes in excess of the number known for the species, but such follicles may not reach maturity. The X-chromosomes were thought to be identified, but they did not show the more lightly stained slender differential segment that is characteristic of the X at meiosis in the male. The X-chromosomes are associated by chiasmata in their short arms, which are in part made up of a portion that has no counterpart in the Y.

Development of the sternum in screw tail mice, V. BRYSON (*Anat. Rec.*, 91 (1945), No. 2, pp. 119-141, illus. 21).—An embryological analysis was made of sternal development of normal and homozygous mice for screw tail (E. S. R., 89, p. 45). Lack of segmentation of the sternum is a direct consequence of retarded rib growth with increased sternal width. The significance of these findings as applied to interspecific and physiological variability is described.

Factors affecting annual egg production, F. A. HAYS and R. SANBORN (*Massachusetts Sta. Bul.* 423 (1944), pp. 12).—In a further statistical study of characters which are related to egg production in the data previously noted (E. S. R., 92, p. 38), simple correlations were determined between 16 independent variables and annual egg production. The Blakeman test for linearity of regression was also calculated. In general, the data suggest the desirability of adding to the list of characters for selective breeding for high annual egg production, high spring,

summer, and fall intensity, and short spring and summer pauses. There was no significant correlation of annual egg production with hatching date or number of broody periods, but annual egg production was negatively correlated with body weight at first egg and positively correlated with annual persistency and time to attain standard egg weight. There was a moderate positive correlation between annual egg production and annual egg weight. The 16 different characters offer a good working basis upon which to direct future breeding operations.

**Measuring roundness of breast in live turkeys.** S. BIRD (*U. S. Egg and Poultry Mag.*, 51 (1945), No. 5, pp. 206-209, 235, illus. 2).—Roundness of breast may be measured by width across the breast when determinations are made at the level at which relative muscular thickness is most acutely expressed. In these studies, width was measured at the level of one-fifth of the body depth above the keel, thus making all determinations at relative levels on small and large birds. On a population of 355 turkeys of various breeds of both sexes, the expected width has been calculated as 4.2 cm. for ♂♂ and 4.5 cm. for ♀♀ plus one-fifth of the full body depth.

**Comparison of purebred and crossbred cockerels with respect to fattening and dressing qualities.** N. R. MEHRHOF, W. F. WARD, and O. K. MOORE. (Coop. U. S. D. A.). (*Florida Sta. Bul.* 410 (1945), pp. 16).—A total of 459 purebred and crossbred cockerels at 10 weeks of age served for a comparison of gains, feed utilization, dressing grade, dressing and drawing losses, and shrinkage in transit after a 2-week feeding period. The average gains in body weight in grams during the 14-day feeding period were Light Sussex × Rhode Island Red 388, Light Sussex 387, Rhode Island Red 371, Single-Comb White Leghorn male × F<sub>1</sub> (Light Sussex × Rhode Island Red) 316, and Barred Plymouth Rock × F<sub>1</sub> (Light Sussex × Rhode Island Red) 356. The feed per gram of gain was in the order Light Sussex × Rhode Island Red, Rhode Island Red, Barred Plymouth Rock × F<sub>1</sub> (Light Sussex × Rhode Island Red), Light Sussex, White Leghorn × F<sub>1</sub> (Light Sussex × Rhode Island Red). Considering these results with the grades and shrinkage, it was concluded for these strains that the two-way cross was in general superior, followed by the purebred and three-way crosses. This study was conducted with groups of 13 to 25 cockerels from the different matings in certain of the 3 years 1940-42 after 10 weeks of age and fattened for 2 weeks at the West Central Florida Substation. The birds were shipped about 100 miles after feeding to the main station, and loss in transit was ascertained.

**The gonadotropic activity of the anterior pituitary of cockerels.** W. R. BRENEMAN (*Endocrinology*, 36 (1945), No. 3, pp. 190-199, illus. 2).—The gonadotropic activity of 864 pituitaries from hatching to 90 days was ascertained and a chick unit established. No significant differences were detected between the acetone-dried pituitaries and fresh glands when injected on the basis of equivalent weight. The total gonadotropic potency of a gland ranged from 0.5 C. U. (chick unit) at 5 days to 8.3 at 90 days. Per milligram potency it varied from 0.19 C. U. on day 23 to 1.0 on day 90. The fluctuation in milligram potency of the pituitaries was compared with the weights of the testes, and correlation was found between them. There was intimate interrelationship between the secretion of the anterior pituitary and the testis weight of White Leghorn cockerels. Good responses were noted in mice, but the quantitative responses were not satisfactory.

**Production of tail abnormalities in chick embryos by transecting the body during the latter part of the second day of incubation.** E. ZWILLING. ([Conn.] Storrs Expt. Sta.). (*Jour. Expt. Zool.*, 98 (1945), No. 3, pp. 237-247, illus. 7).—A transverse cut through the body of chick embryos developing in eggs after 36 to 50 hr. after incubation resulted in the production of tail abnormalities grossly and histologically similar to those found in genetically recessive rumpless embryos by Landauer and Baumann (E. S. R., 89, p. 532). When the cut was made at

the level of the last somite or somewhat posterior, 20 percent of the survivors had short tails. Of the embryos, 62.5 percent had abnormal tails when the cut was made at the junction of the neural tube and the undifferentiated tail bud.

New data on the origin of double avian eggs, A. L. ROMANOFF and F. B. HUTT. (*Cornell Univ. Anat. Rec.*, 91 (1945), No. 2, pp. 143-154, illus. 3).—A 1-year-old Single-Comb White Leghorn hen laid 10 double eggs during May, June, and July of 1943. The double eggs weighed 170-190 gm., each with a shell and containing a complete, shelled egg, albumen, and yolk. The enclosed egg compared with single eggs laid by the same hen showed the enclosed egg to be unusually large and with thicker shells than normal eggs laid singly. It is concluded that the egg subsequently enclosed had been retained unduly long in the uterus and that its return to the albumen tube had been caused by the excitation of the oviduct following the engulfing of the next ovum. On the way back to the uterus the egg and the succeeding ovum acquired common envelopes of albumen, membranes, and shell, a double egg resulting. It is suggested that post-ovulatory excitation of the oviduct may result in the enclosing of dwarf eggs in double eggs. In 4 of the double eggs, blunt and pointed ends could be distinguished, which were probably formed with the blunt and caudad. In 2 of these the enclosed eggs had apparently been reversed end for end after formation.

## FIELD CROPS

[Farm crops research in Colorado] (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 2, pp. 5-6, 12-14).—Progress of experiments with field crops is set forth in articles on Coes Sorghum Adapted Crop for Eastern Colorado, May Be Used To Replace Corn, by J. F. Brandon (pp. 5-6) (coop. U. S. D. A.); Corn Hybrids Tried for Yield and Adaptation Under Irrigation, by J. J. French, D. W. Robertson, and H. Fauber (pp. 12-13); and [Corn Hybrids Tried for Yield and Adaptation] on Dry Land, by J. J. French, D. W. Robertson, J. F. Brandon, and R. Tucker (pp. 12, 14) (coop. U. S. D. A.).

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), Nos. 4, pp. 1, 2, 3, 6, 7, 8, illus. 1; 5, p. 7).—Results of agronomic experiments are reported briefly in No. 4 in articles entitled: Pastures Respond to Mowing With Higher Yields, Better, More Nutritious Herbage, by H. W. Bennett (pp. 1-2, 7); Fertilizer After Winter Legumes for Cotton Production (p. 2), and Value of Winter Legumes Tested at Delta Station (pp. 3, 6), both by J. Pitner; Field and Laboratory Studies on Influence of Soil Aeration on Cotton Root Growth, by O. A. Leonard (p. 3); Delta Soybean Varieties (p. 6); Twin-Row Planting of Sweetpotatoes Tested in the Field in Laurel Area, by W. S. Anderson, O. A. Brown, and J. W. Randolph (coop. U. S. D. A.) (p. 7); and Planting Time of Sweetpotatoes Important Factor, by W. A. Anderson (p. 8). Articles in No. 5 include C. P. 29-119 and C. O. 290 Lead in Sugarcane Test, by T. E. Ashley (p. 7).

Crop residue management in dry-land crop production, O. R. MATHEWS. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 4, pp. 297-306).—Results from experiments in 15 locations in the Great Plains for periods up to 20 yr. and from two locations in the Columbia River Basin, showed the effects of placements of crop residues on crop yields. Methods under trial were those that leave on the surface much of the residues, part of the residues, and those that leave little or no residues. Except at one location where N was a controlling factor, yields have been affected to a very limited extent by placements of residues, and other factors such as long-time erosion control and cost of tillage operations can be used safely to determine efforts that should be expended in keeping residues

on the surface. Effects of residues on wind and water erosion, water storage, soil structure, weed control, and other factors are discussed briefly.

The control of wind erosion by the establishment of turf under airport conditions, R. S. BELI and J. C. F. TEDROW (*Rhode Island Sta. Bul.* 295 (1945), pp. 23+, illus. 9).—About one-half of the soil at the U. S. Naval Air Station, Quonset Point, R. I., consists of made land with a gravelly, sandy texture and the remainder a shallow sandy loam underlain by sandy gravel subsoils. During the construction of the station practically all of the original soil was disturbed, with large sandy areas having little or no vegetation resulting. This condition, accompanied by high winds and periods of little rainfall, presented a serious dust problem reducing the efficiency of delicate mechanisms and comfort of the station personnel. To combat the dust and provide more attractive surroundings for the buildings, native peat was incorporated into the sand material before seeding. This provided an attractive lawn but was too expensive on large areas. On extensive areas, cover crops of rye and millet were grown to keep the dust from blowing and also to build up organic matter content. After several cover crops were incorporated, sufficient organic matter had accumulated in the sand to support some plant growth. Pressing straw in the soil with a disk harrow also prevented wind erosion so that grass seedlings might become established.

Experiments with seed mixtures indicated that creeping red fescue was well adapted for growing on the hydraulic fill, although red fescues did not compete with perennial ryegrass. The ryegrass evidently should be omitted from the seeding mixture or used only in small quantities to insure good stand of the permanent perennial grasses. Grimm alfalfa and smooth bromegrass could germinate and make slow growth in loose coarse sandy soil. Their seedlings survived blowing sand whereas those of several varieties of legumes and grasses were destroyed. Once the alfalfa is firmly established its roots may reach the water table and obtain a more adequate supply of moisture.

Pasture development in the east Texas timber country, E. K. CROUCH and J. H. JONES (*Texas Sta. Bul.* 666 (1945), pp. 20, illus. 9).—Highly productive pasturage has been established on an old worn-out creek bottom field at the Lufkin Substation in the east Texas timber country by use of methods including clearing, drainage, application of superphosphate, and seeding of suitable legumes and grasses. Application of about 200 lb. of phosphoric acid per acre permitted establishment of adapted clovers and grasses and increased both the yield and quality of pasturage. Carpet, Dallis, and Bermuda grasses, and white, hop, and Persian clovers have persisted through the years. Common lespedeza contributed to the grazing, 1936-40. Other lespedezas and clovers and rescue and Italian ryegrass tried, either failed to survive or did not seem of sufficient value to warrant further trial. After establishment, fertilized and highly productive pasture evidently is permanent only as maintained, for if not kept up by proper usage and occasional mowing, it may become unproductive in a very few years. Mowing has been necessary to control weeds and sprouts and to even up "spot grazed" areas resulting even under intensive grazing. Pastures showed beneficial effects from phosphate applications after 9 yr., but production declined somewhat after 5 yr. Improved fertilized pastures have provided more feed and feed of higher quality for a longer period than native pastures. Such pasturage may provide good grazing for 250 to 280 days and may also furnish both hay for winter feed and seed for the improvement of other pastures. Excellent cattle have been produced on the station pastures.

Use of T. V. A. phosphates and limestone on permanent pastures, W. W. WOODHOUSE, JR. (*North Carolina Sta. Agron. Inform. Cir.* 140 (1945), pp. [11], illus. [8]).—When applied on permanent pasture in the mountain area (E. S. R., 85, p. 184) calcium metaphosphate and fused rock continued to be as satisfactory as triple superphosphate. Where lime was used, potassium metaphosphate was

equal to 16 percent superphosphate and potassium as a source of P and K. Its additional calcium seems to give superphosphate a slight advantage on unlimed soils. Both phosphate and lime were necessary for efficient use of either, particularly on very poor or severely eroded soils. Relative response expected from phosphate and lime applications varied with the fertility level and degree of erosion of the soil. Such applications gave a pronounced effect on yield but effects upon plant population usually were nearly as large. Only a slight advantage was shown for applications higher than 64 lb. phosphoric acid every 3 yr., and none for limestone applications exceeding 1 to 2 tons per acre. Effects from 1 ton of lime had not declined appreciably at the end of the seventh season after application. Lespedeza, white clover, and bluegrass were increased by both phosphate and lime applications, and as a result their competition reduced the proportion of weeds and broomsedge.

**Relation of carotene and crude protein content of grasses,** L. G. KEIRSTEAD. (Maine Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 3, pp. 239-240, illus. 1).—Review of the literature indicated a high correlation between carotene content and crude protein in grasses. Carotene breakdown products, it is suggested, take part in N fixation by the plant.

**A comparative study of methods for determining yields of Kentucky bluegrass and white clover when grown in association,** V. G. SPRAGUE and W. M. MYERS. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 5, pp. 370-377).—Percentages of Kentucky bluegrass and white clover were determined by botanical separations and by the inclined point quadrat in trials of 15 strains of Kentucky bluegrass grown in small plats distributed at random in four replications and seeded uniformly with white clover. For botanical separations, samples were clipped with a grass shears within the yield strip before harvesting with a lawn mower. At the first clipping date, size of the samples averaged 20.7 percent of the yield of the harvested strip, while in three subsequent cuttings, samples averaged between 12.4 and 16.2 percent. Variance within plats was low compared with estimated true variance between plats within replications, suggesting that the sampling method provided a reliable measure of the percentage of white clover. Since the error in subsampling was low compared to variability within plats, samples one-fourth the size of the usual samples could be used. With the inclined point quadrat, the estimated percentage of clover was lower than that in botanical separations, the general means by the two methods being, respectively, 10.2 percent and 17.1 on June 23 and 49.8 and 68.3 percent on October 19. On the basis of strains, the greatest difference in clover between the two methods on June 23 was 13.0 percent while the least difference was 2.7. On October 19, differences ranged from 26.0 to 13.4 percent. Inaccurate results evidently would be obtained by using a constant to convert the point quadrat data to percentage by weight basis.

**Cation-equivalent constancy in alfalfa,** F. E. BEAR and R. L. PRINCE. (N. J. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 3, pp. 217-222).—Analyses of eight successive harvests of alfalfa from 20 different New Jersey soil types indicated that, although Ca, Mg, and K, ratios varied widely, the sums of the equivalents of Ca, Mg, and K per unit of plant material tended to be a constant for the product of any given harvest. This constant had a value approaching 170 milliequivalents per 100 gm. dry matter in the first crop and 187 m. e. in the eighth. The evidence supported the belief that each of these cations has at least two functions in the plant, one specific and the other or others of the type that can be performed interchangeably by all three cations. Na content was too small to be significant. Alfalfa tended to accumulate K in excess of its specific need for the element. A suggestion is to fortify the soil with an abundance of Ca and Mg at seeding time, but to apply K annually and not in such excess as to effect a substitution of K for Ca and Mg in functions common to all three cations.

The yield and sugar content of alfalfa cut at various times of day and the sugar content of the hay after various methods of drying, S. T. DEXTER. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 5, pp. 394-399).—In an experiment designed to measure the yield of alfalfa hay when cut at different times of day (8 a. m., 12 p. m., 4 p. m.) no marked increases occurred from morning until night, nor were large decreases found from evening until the next morning. At about one-half bloom, a growth of about 100 to 300 lb. of dry matter per acre per day took place. In almost continuously sunny weather, a small but rather consistent increase occurred in the percentage of sugars and starch in the hay during the day. When hay samples were dried in unheated circulated air over 3 days, there was a considerable loss of sugars and starch as compared with rapidly dried samples, and losses of sugar were still more pronounced. When hay was dried much more slowly over 3 weeks in a mow drier, ordinary field-cured hay was far higher in sugar content than was hay dried slowly in the mow. Trials in progress might indicate the influence of slow mow drying upon feeding value of the hay. See also earlier notes by Curtis et al. (E. S. R., 93, p. 143).

Buffalo alfalfa, C. O. GRANDFIELD. (Coop. U. S. D. A.) (*Kansas Sta. Cir.* 226 (1945), pp. 7, illus. 2).—Buffalo alfalfa, derived from a strain of Kansas Common resembles the latter in most plant characters, range of adaptation, seed production, and resistance to leaf and stem diseases, but has the advantage of high resistance to bacterial wilt. Its growth in spring and fall is a little more upright than that of Kansas Common, and it makes a slightly more rapid recovery after cutting. In comparable tests in Kansas, Buffalo has yielded nearly the same as other adapted varieties in new stands and has outyielded them when the stands became older.

Irregular barley, *Hordeum irregulare* sp. nov., E. ÅBERG. (Wis. Expt. Sta coop. U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 5, pp. 161-164, illus. 1).—One of the types of barley endemic to Abyssinia is best described by the single word, irregular. These barleys, which have been erroneously included under *H. intermedium*, are here segregated as distinct and described as a new species.

Behavior of various selections of Kentucky bluegrass, *Poa pratensis* L., when grown as spaced plants and in mass seedings, H. L. AHLGREN, D. C. SMITH, and E. L. NIELSEN. (Univ. Wis. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 4, pp. 268-281).—Approximately 11,800 plants of 490 progenies of Kentucky bluegrass, representing 353 collections made in Wisconsin, 92 in other States, and 45 in foreign countries, were grown in space-planted rows in breeding nurseries at Madison, Wis., 1936-39, inclusive. Seventy-four of the better-appearing progenies, selected as of sufficient promise to warrant further evaluation, were grown in small plot trials. In small plots the original differences between most strains tended markedly to become less pronounced as seedlings became older. The practical value of strains significantly more productive than commercial bluegrass must be determined in further studies. Slight relation was noted between yields of the same selections during the first and second harvest years on relatively fertile soil. A good relation existed between the yields of the same selections during the second, third, and fourth harvest years on both relatively fertile and infertile soils. Estimated yields of the selections grown in space-planted nursery rows had little relation with yields in mass seedings. Correlations obtained when yields and competitive ability with white clover were compared were too low to be of much value for purposes of prediction. The principal diseases on Kentucky bluegrass were leaf spot, leaf rust, and mildew. In addition some genotypes were affected by stripe smut. Development of disease was greater among plants in space-planted nursery rows than among those in mass seedings. Little or no relation was noted between yields of selections in mass seedings and disease reaction.

An evaluation of Kentucky bluegrass, B. A. BROWN and R. I. MUNSELL. ([Conn] Storrs Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 4, pp. 259-267).—In two lawn-mowed and two tractor-mowed experiments, each extending over several years, during the period 1936-44, Kentucky bluegrass, either alone with liberal N fertilization or in mixtures with Ladino clover, produced about the same quantity and quality of forage as orchard grass, Rhode Island bent, and timothy. Ladino clover maintained stands as well with Kentucky bluegrass as with the other grasses. Kentucky bluegrass was superior to all other grasses in maintaining good stands for long periods.

Relation between number of parental lines and theoretical performance of synthetic varieties of corn, M. L. KINMAN and G. F. SPRAGUE. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 5, pp. 341-351, illus. 2).—Yield tests involved 10 inbred corn lines, the 45 possible single crosses and their  $F_2$ . From the performance of parent lines and their  $F_1$  hybrids,  $F_2$  yields were calculated on the assumption of arithmetic and geometric gene action. Somewhat closer agreement was obtained between observed  $F_2$  yields and the arithmetic gene action assumption. Theoretical calculations made of yielding abilities of 2 to 10 line synthetics indicated that 4 to 6 lines was the most efficient number. Synthetics made from combinations of lines or single crosses would be expected to yield somewhat higher than synthetics from top-cross combinations.

Kansas corn tests, 1944, A. L. CLAPP, E. G. HEYNE, C. D. DAVIS, and W. O. SCOTT. (Coop. U. S. D. A.). (*Kansas Sta. Bul.* 325 (1945), pp. 35, illus. 1).—Extensive corn tests in Kansas (E. S. R., 91, p. 280) are reported in detail for 1944 and are summarized for 1939-44. The State was divided into seven districts on the basis of soil, rainfall, and growing season. The 1944 testing program comprised open-pollinated varieties and hybrids developed and distributed by State, Federal, and commercial agencies. Commercially available hybrids in experiment field or corn performance tests that stood up as well as or better than the open-pollinated varieties and produced at least 10 percent more grain, and the hybrids outstanding in the cooperative corn tests, are listed.

Corn hybrid and variety performance in North Dakota, W. WINDAKAS (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 4, pp. 3-8).—The comparative performance and adaptation of Nodakhybrid, Minhybrids, and Wisconsin hybrids and certain open-pollinated corn varieties are reported on with descriptions of hybrids and varieties tested 1942-44.

South Dakota corn performance test, 1944, K. F. MANKE and J. E. GRAFUS (*South Dakota Sta. Cir.* 55 (1945), pp. 31, illus. 1).—Tests involving 156 corn hybrids and open-pollinated varieties in different sections of South Dakota are reported on as heretofore (E. S. R., 91, p. 408). Tables show acre yields, moisture at harvest, and stands for each test field in 1944 and district averages for several years.

Corn fertilization studies in 1944, B. A. KRANTZ. (Coop. U. S. D. A.). (*North Carolina Sta. Agron. Inform. Cir.* 139 (1945), pp. 11+, illus. 1).—In cooperative experiments largely on Norfolk sandy and fine sandy loam, and using adapted North Carolina hybrids, the largest increase due to fertilization was from 19 to 107 bu. per acre under good moisture conditions and the lowest was from 21 to 53 bu. under very droughty conditions. N was the major factor in increasing corn yields in all experiments. For efficient use of improved soil fertility or high rates of fertilization, closer spacing needs to be used and late, deep cultivations avoided. While drought is an important limitation to high yields, it appeared that corn yields could be increased by adequate fertilization even under droughty conditions. Where a good growth of vetch was plowed under, corn yields were increased substantially. In general, the quantity of N added was much more

important than the cover crops in determining yields. At most locations rye either increased yields slightly or did not affect them. Under droughty conditions soil moisture was conserved and corn yields increased substantially by mulching with straw, while it had no significant effect on yields under good moisture conditions. When moisture was good, yields were increased by closer spacing at high N levels, but decreased at the lower N levels.

**Cotton variety tests in Georgia, 1942-1944,** R. P. BLEDSOE, W. W. BALLARD, and A. L. SMITH. (Coop. U. S. D. A.). (*Georgia Sta. Cir. 147 (1945)*, pp. 8).—Of 11 varieties tested annually for 3 yr. in middle and north Georgia, Empire produced the highest yield and money value, but was followed closely by several Coker varieties. Coker Wilds produced the lowest average yield of lint, while ranking high in money value due to current high premiums on middling grade long fiber. Empire, Coker 100 Wilt, and Coker 100 produced the highest average yield and money value in north Georgia tests, 1944. Coker 100 Wilt and Stonewilt were superior in yield and money value in tests 1942-44, conducted at three or four locations annually in the Coastal Plain. CCS 3720, Coker 100 Wilt 3 and 4, and Stonewilt 4 are the leading varieties in yield and money value in south Georgia (Coastal Plain) tests, 1944.

**Cotton fiber: Strains grown influence quality,** J. H. MOORE (*Res. and Farming [North Carolina Sta.]*, 3 (1945), *Prog. Rpt. 3*, pp. 3-4, illus. 1).—Marked differences within and between cotton varieties in fiber diameter and length of staple are described and illustrated.

**Response to residual phosphorus of cotton in continuous culture,** G. W. VOLK. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 5, pp. 330-340, illus. 2).—Residual effects of P accumulated from fertilization (1930-43) on the yield of cotton grown on uneroded Hartsells very fine sandy loam were studied. Phosphate fertilization was discontinued, 1935-43, on certain plats. When P fertilization was discontinued after 30, 60, 90, and 120 lb. rates of  $P_2O_5$  had been used annually, 1930-34, yields of cotton decreased decidedly. The residual effects on cotton that followed, were obtained from the accumulated P, which was more or less in proportion to the amount added. Regardless of rate of P application 1930-34, a drop of about 200 lb. of seed cotton occurred in the first or second year after fertilization stopped. Cotton yields where 30 lb. of  $P_2O_5$  were applied in 1930-34 fell below the original yield of the check plats about 3 yr. after P fertilization was discontinued, whereas this point was reached in about 7 yr. where 60 lb.  $P_2O_5$  had been applied. The total amount of P unaccounted for by chemical analyses of soil and by crop removal in the surface 16 in. of soil approximated 25 percent of all added plus that in the original soil. This amount was about 2.5 times as much as was removed by cotton, 1930-43. P unaccounted for in the crop or in the 16-in. of soil is considered lost by erosion.

**Responses of cotton to sulfur fertilization,** H. C. HARRIS, R. W. BLEDSOE, and P. W. CALHOUN. (Fla. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 5, pp. 323-329, illus. 3).—Results obtained with cotton in experiments on three soil types at Gainesville and Madison (locations about 100 miles apart) indicating S deficiency for the crop suggested that there may be large areas in Florida where S is deficient.

**Derris agronomy: An annotated bibliography and a critical review, [I-III],** R. E. MOREAU (*East African Agr. Jour.*, 10 (1945), Nos. 2, pp. 75-82; 3, pp. 168-176; 4, pp. 243-250).

**Effect of seedcoat injuries during threshing on emergence of flax seedlings,** D. D. FORSYTH and O. A. VOGEL. (Wash. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 5, pp. 387-393).—Important causes of yearly variation in initial stands of flax at Pullman, Wash., were found to be considerable amounts of minor mechanical damage to the seed due mainly to machine threshing

and the presence of soil-borne organisms, mainly *Fusarium oxysporum*. The problem of poor emergence was more acute in soil from Pullman than from other areas of Washington, apparently due to differences in soil microflora.

**Sheyenne:** A new variety of flax, T. E. STOHL (Coop. U. S. D. A.). (*North Dakota Sta. Bino. Bul.*, 7 (1945), No. 4, p. 17).—Sheyenne flax (C. I. 1073), a selection from Ottawa 770B × Buda made by H. H. Flor, ripens early, has blue flowers and brown seed, and grows about as tall or only slightly less than Bison. The seeds are slightly smaller than those of Bison but give a satisfactory yield of oil and the iodine number is better than that of Bison. The straw is not quite as strong as Bison straw but is stronger than that of Buda. Sheyenne is immune to races of rust known to exist in this country, is highly wilt resistant, and has about the same degree of tolerance to pasmo as Bison, Buda, and Koto. This variety may have its largest use in the southeastern sections of North Dakota where earliness is desirable to escape high summer temperatures or late droughts.

The effect of moisture stress on nursery-growth guayule with respect to the amount and type of growth and growth response on transplanting, O. J. KELLEY, A. S. HUNTER, and C. H. HOBBS. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 3, pp. 194-216, illus. 7).—A nursery irrigation experiment dealt with effects of soil moisture stresses on amount and type of growth, rubber and resin contents, and after-transplanting growth responses of guayule nursery stock. Plants grown under high moisture stresses (low soil moisture) in the nursery, in comparison with plants grown under low moisture stresses (high soil moisture), produced significantly less vegetative growth; had higher rubber, resin, and lignin contents, and in the fall had higher inulin content; when transplanted, resumed growth faster, grew more vigorously, and in fall transplantings had a much higher percentage survival; and were comparatively better able to endure unfavorable conditions after transplanting. Effects of variations in moisture stresses under which they were grown were still evident in the after-transplanting growth responses of nursery plants 9 mo. after differential moisture treatment ceased. While soil moisture was at a low tension near the surface, plants absorbed their water almost entirely in this region. When the topsoil approached the wilting point the water was absorbed from the lower depths. There was little difference in depth of root penetration by plants grown under high and low moisture stresses.

Growth and development of kenaf, *Hibiscus cannabinus* L., with special reference to fiber content of the stems, J. C. CRANE and J. B. ACUNA. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 5, pp. 352-359, illus. 2).—Periodic determinations were made at the Cuban Agricultural Experiment Station on the percentage of various component plant parts and the morphological appearance of the plant throughout the life cycle. Developmental changes in plant characters and their interrelationships, and the response of kenaf to length of day, are discussed. Kenaf evidently should be harvested during the flowering stage, to obtain best results in yield and in separation of fiber from the stems.

**Mung beans:** A legume for seed and forage production, L. L. LIGON (*Oklahoma Sta. Bul.* 284 (1945), pp. 12, illus. 1).—A revision of Circular 104 (E. S. R., 87, p. 664, now including yield data and results of feeding trials. Tests of green mung bean seed as a source of protein in rations of poultry, swine, and fattening lambs indicated that mung beans can replace vegetable sources of protein such as cotton-seed or soybean meal, but are not a substitute for animal protein such as meat and bone scraps or tankage. Even though sound beans may be too high-priced for use as feed, beans which are cracked or otherwise unsuitable for sprouting or seed can be used.

**Hybrid popcorn:** A. M. BRUNSON and G. M. SMITH. (U. S. D. A. coop. Kans. and Ind. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 3, pp. 176-

183, illus. 1).—In an account of the development of popcorn hybrids as a cooperative project, desirable characters of value to producers and consumers are discussed and the method of determining popping expansion is described. Performance records of 10 hybrids, 1941-43, show yield increases of 9 to 68 percent over corresponding open-pollinated varieties, accompanied by better standing ability and higher popping expansion. Seed production of these popcorn hybrids has about trebled each year (1940-44), and now accounts for an appreciable proportion of the popcorn acreage of the United States.

Potato production in the Western States, W. C. EDMUNDSON, B. J. LINDIS, and L. A. SCHAALE (*U. S. Dept. Agr., Farmers' Bul. 1843, rev. (1944)*, pp. 58+, illus. 45).—In this revision and enlargement (E. S. R., 83, p. 334), production practices in growing, harvesting, and handling potatoes under irrigation and on dry land in the Western States are discussed together with information on potato diseases (adapted largely from Farmers' Bulletin 1881) (E. S. R., 86, p. 642) and on insects and their control.

The effect of planting dates on the yield of Triumph and Red McClure potatoes in the San Luis Valley, J. G. MCLEAN (*Colorado Sta. Press Bul. 99 (1945)*, pp. [4], illus. 2).—When enough water was available for subirrigation (1941-42, 1944), between May 5 and 20 was optimum for planting. In dry years planting date had little influence on total yield. Use of fertilizer produced no marked improvement in yield in dry years, but when sufficient water was available its use extended the range of optimum planting dates for both Red McClure and Triumph potatoes and markedly increased yield, particularly for the earlier planting dates. Triumphs evidently can be planted after June 1 with less loss in yield than can McClures.

The Sequoia potato: A recently-introduced insect-resistant variety, M. E. GARDNER, R. SCHMIDT, and F. J. STEVENSON. (N. C. Expt. Sta. coop. U. S. D. A.). *Amer. Potato Jour.*, 22 (1945), No. 4, pp. 97-103, illus. 1).—The Sequoia potato (North Carolina Seedling No. 130.5-24 derived from Green Mountain  $\times$  Katahdin) is a high-yielding, late-maturing variety that has shown marked resistance to damage by flea beetles and leafhoppers. While vine resistance to late blight has been evident, the tubers are susceptible to rot initiated by the late blight organism. Plants should be sprayed or dusted but probably will not require as intensive a program of spraying as Green Mountain or Irish Cobbler. Some stem-end browning has occurred in North Carolina, but thus far cannot be attributed directly to net necrosis caused by leaf roll virus. Sequoia has responded satisfactorily to a wide range of soil and climatic conditions, but in North Carolina best results have been obtained on upland soils. Because of its vigor, Sequoia produces rough, oversize tubers with a tendency to hollow heart condition if spaced too widely in the row or if fertilized too heavily.

Sprouting of potatoes inhibited by plant hormones, J. E. THOMAS and A. J. RIKER. (Wis. Expt. Sta.). (*Amer. Potato Jour.*, 22 (1945), No. 4, pp. 104-113, illus. 2).—Sprouting of Chippewa, Cobbler, Red Warba, Russet Burbank, Russet Rural, and Triumph potatoes stored above 21° C. (70° F.) has been prevented for some time by treatments with about 0.9 gm. (0.03 oz.) of the methyl ester of  $\alpha$ -naphthaleneacetic acid per bushel. This chemical, the best of several tried, could be used in various ways, but applications with dust and with shredded paper were most promising and treatments just before advent of warm temperatures seemed most effective. Some of the treated large Cobbler potatoes developed hard knobby growths, usually in the bud area, and in extreme cases these cracked open and blackened on the surface but did not seem to rot more readily than the normal tissue. Decay incident to sprouting was reduced by sprout inhibition. The treatment was not found to induce blackening of tubers when they were boiled.

**Seed and seedling characters in certain varieties of soybeans**, C. S. DORCHESTER (Iowa Expt Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 3, pp. 223-232, illus. 6).—Seed and seedling characters of 28 varieties of importance in the Corn Belt are classified and a seed key and a seedling key formulated. Leaf and leaflet shapes for each variety are recorded by photographs.

**Rancher: A low hydrocyanic acid forage sorghum**, C. J. FRANZKE (South Dakota Sta. Cir. 57 (1945), pp. 8, illus. 2).—Rancher, developed from a cross between two strains from Dakota Amber sorgo, has the lowest HCN content of any named forage sorghum in production, containing only about one-tenth as much as commercial varieties. Rancher matures early; is medium in height, from 60 to 69 in. or taller; has mid-stout stems which are heavier and leafier than those stems of Dakota Amber 39-30-S; and tillers freely. The kernel is light brown, somewhat elliptical in shape and enclosed by large black glumes flaked with reddish brown. It makes good yields of both forage and seed. Maturing in about 90 to 100 days, it is adapted to all parts of South Dakota and to a wide range of soils, but does best on well-drained, deep, fertile loams. Cultural and harvesting practices are outlined.

**Natural crossing in Sudan grass**, R. J. GARBER and S. S. Atwood. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 5, pp. 365-369).—Natural crossing between tan and nontan selfed strains of Sudan grass of hybrid origin (Leoti sorgo X Sudan grass) at State College, Pa., was found to average 76.4 percent in 1941, 18.2 in 1942, and 34.4 in 1943. There were significant differences with respect to strain and season. Results reported here, as well as those reported from the Texas Experiment Station, indicated that incidence of natural crossing was significantly greater in this material than has been reported for sorghum.

**Polyploidy in sugar beets induced by storage of treated seed**, F. F. LYNES (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 5, pp. 402-404).—Polyploidy was induced by storage of sugar beet seed treated with an organic fungicide alone and in combination with fume phosphate in commercial warehouses in four western States. The effect was greater for seed stored in burlap than for those in paper bags, and sheared seed were affected more than whole seed.

**Effect of planting rate on fiber yield of *Urena lobata* L. as compared with kenaf, *Hibiscus cannabinus* L.**, J. C. CRANE and J. B. ACUNA. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 4, pp. 245-250).—*U. lobata* seed, not free of carpel parts, planted in a fertile Matanzas clay at Aguacate, Cuba, at the rate of approximately 25 lb. per acre in 8-in. rows with 6 in. between plants, yielded after 7 months' growth 2,089 lb. of fiber, while seed broadcasted at the rate of 40, 35, 30, 25, and 20 lb. per acre yielded 1,982, 1,908, 1,719, 1,239, and 1,456 lb. of fiber per acre, respectively. The plant population at harvest time was nearly the same regardless of differences in rate of seeding, which was attributed to germination and to self-thinning. Thirty plants per square yard was the maximum plant population the soil could support. Kenaf plants 6 in. apart in 8-in. rows yielded 1,505 lb. of fiber per acre 80 days after planting with progressive increase to 3,032 lb. at 120 days. Its more rapid growth and higher fiber yield, comparatively simpler cultural requirements, and ease of extraction of fiber from the stems recommend kenaf rather than *U. lobata* for production under Cuban conditions.

**Fertilizing wheat for yield and quality**, H. F. MURPHY (*Oklahoma Sta. Bul.* 285 (1945), pp. 21, illus. 17).—A group of experiments to determine effects of commercial fertilizers upon the yield of wheat and on the quality of grain, flour, and bread were in progress between 1924 and 1944. All fertilizers containing P resulted in higher grain yields than other combinations. A mixture of three-fourths superphosphate and one-fourth sodium nitrate, which gave higher yields than superphosphate alone, was the best combination tested, considering both yield and protein. Wheat from this plat also made a superior loaf having slightly greater volume than

test loaves from unfertilized wheat. P fertilization gave much greater fall growth, and phosphated plats would have furnished considerably more fall pasture. The percentage of protein in both grain and flour was reduced by P fertilization and increased by N, whereas K had little effect. Color and texture scores of bread were only slightly affected by the different fertilizer treatments. Residual effects of superphosphate were pronounced in maintaining yields, although high rates of this material with limited or no N resulted in definite N deficiency in the wheat plant. Residual effects of N and K were much smaller. Dry foot rot was less severe in 1943 on plats adequately supplied with P. Wheat treated with sodium nitrate produced a flour slightly higher in protein than did wheat receiving ammonium sulfate. Between fall and spring N applications there was little difference in the protein content of the flours. Protein content was influenced most by available N supply at about the boot stage of plant growth.

Milling, baking, and chemical properties of Marquis and Kanred wheat grown in Colorado and stored 14 to 22 years, C. C. FIFIELD and D. W. ROBERTSON. (Colo. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 3, pp. 233-239).—Tests were made on samples of Marquis wheat from the crop years 1921-27, 1929, and 1942, and of Kanred wheat from the crop years 1921, 1924, and 1929, stored at Fort Collins, Colo., in a dry, unheated room (E.S.R., 82, p. 480) from 14 to 22 yr. After storage for 22 yr., 22 percent of Marquis and 4 percent of Kanred germinated.

Storage had no consistent effect on the protein content of the grain. Ash content of the flour increased somewhat with storage, due perhaps to brittleness of the bran coat, with the result that more pulverized in milling and was carried over into the flour. A definite and fairly regular but small increase in fat acidity occurred with storage, samples stored for the longer periods having fat acidity values ordinarily indicative of considerable deterioration. Such deterioration was not apparent from the baking tests, since satisfactory bread was made from all lots of flour. The best bread was made from the 1921 crop, probably attributable to the higher protein content of the flour. Thiamine content of the wheat, flour, and bread, determined in 1943, showed no differences greater than might be due to differences in the grain when it was first stored.

Ree wheatgrass: Its culture and use, C. J. FRANZKE (*South Dakota Sta. Cir.* 58 (1945), pp. 8, illus. 1).—Ree wheatgrass, a new pasture and hay grass released by the station (introduced by the U. S. Department of Agriculture from Russia), is a perennial producing abundant creeping rootstalks, a dense sod, erect leafy stems from 30 to 48 in. tall, and plenty of seed. The grass appears to be drought-enduring, and withstands more heat and drought than bromegrass. It is exceptionally cold resistant and can resist the rigors of South Dakota winters. Ree wheatgrass grows on a wide range of soil types but does best on fertile loamy soils. It tolerates a higher salt (alkali) concentration in the soil than does crested wheatgrass. The grass is highly nutritious and palatable to all classes of livestock. From grazing trials at the station, it appears to be more palatable than bromegrass. Ree wheatgrass should be in grass mixtures for pastures since it starts growth very early in the spring and remains green late in the fall. Hay of the best quality is produced by harvesting in the early bloom stage. Seeding and harvesting practices are outlined.

Seed inspection, F. A. McLAUGHLIN (*Massachusetts Sta. Control Ser. Bul.* 123 (1944), pp. 41).—Purity, weed seed contents, and germination percentages are reported for official samples of seed of field crops and seed mixtures and germination for samples of vegetable seed collected in Massachusetts during the year ended November 1, 1944. Reports are also made on field tests for trueness to type and variety on lots of beans, beets, carrots, corn, and spinach, in conjunction with G. B.

Snyder; and on germination and performance tests of flower seeds, by C. L. Thayer and E. B. Risley.

**Proceedings of the Association of Official Seed Analysts, 1943 [and] 1944 (Assoc. Off. Seed Anal. Proc., 35 (1944), pp. 160, illus. 12).**—Papers presented at the thirty-fifth annual meeting at Columbus, Ohio, July 17-21, 1944 [no meeting in 1943] included Rules for Testing Seeds—Association of Official Seed Analysts (pp. 17-42); committee and subcommittee reports on research, by G. P. Steinbauer et al. (pp. 43-55) (Maine Expt. Sta. et al.); methods for the analysis of small seeds, by L. A. Kaniipe (pp. 56-57) (Oreg. State Col.); phytopathological techniques, 1943 (pp. 58-63); range grass studies, by E. L. Norris and A. Decker (pp. 63-67) (Kans. Sta.); viability of injured weed seeds, by D. G. Hooker, reporting germination of common ragweed seeds, by A. C. Heise; and hard seeds, by G. P. Steinbauer (Maine Sta.) (pp. 67-68); Report and Recommendations of the Special Committee on Standardized Tests, 1943 [and 1944] (pp. 69-74); Value of Field Tests as a Supplement to Laboratory Tests in Evaluation of Vegetable Seeds, by H. D. Brown (pp. 79-80) and Poor Crops From Good Seed, by R. D. Lewis (pp. 82-84) (both Ohio State Univ.); Seed Science and Weed Control, by N. G. Lewis (pp. 84-86); Status of Seed Control, by W. A. Davidson (pp. 86-89) (U. S. D. A.); Routine Seed Inspection, by A. S. Carter (pp. 89-90) (Ind. Sta.); The South Dakota Seed Blower, by E. L. Erickson (pp. 91-95) (S. Dak. Sta.); Seed Analysts Salaries, by C. N. McIntyre (pp. 96-98); Some Fungi Found in Seedstocks During Recent Years, by W. Crosier (pp. 99-102) (N. Y. State Sta.); Germination of Seed of Florida Beggarweed, by O. L. Justice (pp. 103-104); Germination of Unscarified and Scarified Seed of *Lathyrus hirsutus* L., Under Laboratory, Greenhouse, and Field Conditions, by O. L. Justice and R. W. Marks (pp. 104-115); Recent Findings on Laboratory Germination and Longevity of New Zealand Spinach Seed, by C. E. Heit (pp. 115-120) (N. Y. State Sta.); Studies on the Germination of Lettuce Seed Inducing Dormancy With Coumarin, by G. E. Nutile (pp. 120-135); Methods of Germinating Tobacco Seed, by E. C. Vaughn (pp. 136-138) (Ky. Sta.); Germination of Freshly Harvested Seed of Western Grown Astoria Bentgrass, by A. M. Andersen (pp. 138-146), and Preliminary Study of Seed of Crested Wheatgrass Exhibiting Delayed Germination, by A. M. Andersen and V. C. Drake (pp. 146-153) (both U. S. D. A.); Soybean Sprout Production—A Germination Problem, by M. T. Munn (pp. 153-155) (N. Y. State Sta.); and Problems in Testing Seed Stocks of Buffalo Grass, by E. O. Brown (pp. 155-158) (U. S. D. A.).

**A general look at the weed problem, M. A. McCALL. (U. S. D. A.). (Jour. Amer. Soc. Agron., 37 (1945), No. 5, pp. 378-386).**—The weed problem in the United States is outlined with comments on the necessary steps in its solution, including research and control activities.

**Important perennial weeds in Montana: Their identification and control, S. C. LITZENBERGER, A. H. Post, and H. E. MORRIS (Montana Sta. Bul. 426 (1945), pp. 45, illus. 27).**—Descriptions, habitats, and distributions are presented for blue lettuce, Canada thistle, leafy spurge, perennial ragweed, perennial sowthistle, povertyweed, quackgrass, Russian knapweed, showy milkweed, silverleaf franseria, skeletonweed, St. Johnswort, whitetop, wild licorice, wild morning-glory or bindweed, and yellow toadflax, important perennial weeds in Montana. Control methods outlined, drawn extensively from station experiments and experience, cover clean cultivation, delayed cultivation alone or with competitive crops or crop rotations, chemicals, hoeing, smothering, burning, spraying with oil, pasturing, and mowing. Costs of cultivation and chemicals for weed control are compared.

**Field bindweed, *Convolvulus arvensis* L., root fragments may grow, L. V. SHERWOOD. (Ill. Expt. Sta.). (Jour. Amer. Soc. Agron., 37 (1945), No. 4, pp.**

307-313, illus. 1).—Fragments of roots of bindweed were transplanted at various depths in previously prepared soil, 1936-41. Although they did not always grow, enough survived to be a factor in local spread of the weed. Soil dry enough to pulverize easily and break loose from root fragments or leave them free from large soil particles, was unfavorable for root fragment growth. Shallow cultivations were deemed not likely to spread bindweed by root fragments. Fragments low in food reserves and transplanted under favorable conditions made little or no growth.

**Competitive crops effective in stopping field bindweed,** H. K. WILSON, A. H. LARSON, and L. M. STAHLER. (Coop. U S. D. A.). (*Minn. Farm and Home Sci [Minnesota Sta.]*, 2 (1945), No. 3, pp. 4-5, illus. 4).—Field bindweed (E. S. R., 89, p. 213) could be eliminated with a minimum of cultivation and a valuable feed crop produced each year in experiments at Lamberton. Use of summer competitive crops is rather well limited to crops which can be grown after July 1. Soybeans, sorgo (Amber), and Sudan grass in each trial gave complete eradication with 3 yr. of tillage and cropping. Sorgo grown for hay yielded the greatest tonnage of feed, and next in order came corn as hay, Sudan grass, millet, and soybeans. Sudan grass and sorgo from the viewpoint of total production of feed, ease of growing, and general effectiveness, are valuable in a program of this type. Although soybeans yielded less feed, they are more valuable in many cases because the feed is high in protein. No advantages followed use of a full season of fallow either at the start or during experiments.

**Fighting fern without fire,** A. ARNST (*U. S. Dept. Agr., Soil Conserv.*, 10 (1945), No. 12, pp. 268-270, illus. 3)—Characterizing the fern *Pteridium aquilinum pubescens* as a blessing to foresters and a curse to farmers, the author discusses its growth habits, toxicity to farm animals, ground taking potentialities, etc., and shows how ferns on pasture land can be controlled by tillage and destruction of the rootstocks. Repeated mowing in midsummer will also weaken the fern plants.

Burning is a last resort and, if practiced on land unfavorable to tillage operations, should be done in autumn and followed by seedings of perennial grasses such as Chewings fescue, alta fescue, creeping red fescue, highland bentgrass, orchard grass, and tall oatgrass.

**A new herbicide, 2,4 dinitro 6 secondary butyl phenol,** A. S. CRAFTS. (Univ. Calif.). (*Science*, 101 (1945), No. 2625, pp. 417-418).—Recent studies on a series of dinitro compounds of the substituted phenols indicate that they may furnish herbicidal chemicals with properties more desirable than those of most herbicides in common use. From a number of exploratory experiments involving the testing of 50 nitro and chloro compounds of benzene, phenol, and various substituted phenols it appears that toxicity to plants increases through the series of benzenes, phenols, and substituted phenols. Dinitro compounds are more toxic than nitro, chloro, or nitro-chloro compounds. Ortho-substituted salts are more toxic than meta or para. Of the dinitrophenols tested, aliphatic chain substitutions were more toxic than cyclic or aromatic. The 2,4 dinitro compounds of phenol, *o*-methyl, *o*-ethyl, *o*-isopropyl, and *o*-secondary butyl phenol respectively increase in toxicity in the order named. The *o*-amyl-substituted compound drops off in toxicity. The ammonium salts of these phenols are soluble enough in water to serve as effective herbicides. The parent dinitro phenols are very slightly soluble in water, but their solubility in oil increases with increasing length of the substituted aliphatic chain. Dinitro phenol is too low in solubility in oil to be of use as a herbicide. Dinitro-*o*-cresol is soluble to about 5 percent and has been used as a fortifying agent in diesel oil for weed killing. Because of its high toxicity the secondary butyl compound is more effective, and its relatively greater solubility in oil enhances its value. The increasing solubility in oil may offer a clue to the increasing toxicity of

the dinitro compounds of substituted phenols; in general, substances soluble in lipoids pass readily through cytoplasmic membranes. In these compounds, toxicity reaches a maximum with the butyl substitution. By mixing dinitro-*o*-secondary butyl phenol in such an oil at a concentration around 5-10 percent and adding emulsifiers so that the mixture will form a fairly stable ready-mix type of emulsion, a general contact herbicide can be made that would require only 3-6 percent oil—a saving of over 90 percent of the oil that has been used for weed control. It will kill certain oil-tolerant weeds that are not ordinarily controlled. The materials are not dangerously inflammable, and the poison hazard is much less than with arsenic, livestock not being attracted by the taste as they are by sodium arsenite.

## HORTICULTURE

Breeding plants for adaptation, freedom from insect injury, and disease resistance, B. D. DRAIN. (Tenn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 225-228).—This is a general discussion of the problems in plant breeding in the Southern States, where the long growing season is favorable for insect and disease development as well as for plant growth. The absence of a well-defined winter may be an advantage in some respects, but introduces the need of fruit trees that will remain dormant during protracted warm periods in the winter months. Something is said of breeding accomplishments with the pear, red raspberry, strawberry, and certain vegetables, and of the needs yet unsatisfied. The magnitude of the task in developing and introducing a new horticultural variety is discussed.

Rooting greenwood cuttings without sunlight under fluorescent lamps, V. T. STOUTEMYER, A. W. CLOSE, and F. L. O'ROURKE. (U. S. D. A.). (*Science*, 101 (1945), No. 2630, p. 546).—Investigations in 1942 indicated that more rapid rooting of cuttings of *Wiegela floribunda*, *Ligustrum ovalifolium*, and *Chrysanthemum morifolium* could be obtained in a basement under continuous illumination from a 100-w. Mazda lamp than in the conventional greenhouse propagating frame. Further studies showed good results from the use of small detached propagation cases of opaque material, each fitted with a 30-w. fluorescent lamp. Temperature and relative humidity were easily controlled in the cases. As to optimum length of day, the various species which included *Citrus*, *Cinchona*, *Severinia*, *Hibiscus*, and *Bougainvillea* appeared to vary somewhat in their requirements.

New Jersey vegetables, V. A. TIEDJENS (*Hort. News [N. J. State Hort. Soc.]*, 26 (1945), No. 4, pp. 1709, 1711, illus. 1).—With yields of sweetpotatoes ranging from 60 to 500 bu. per acre, the author discusses practices in liming, preparing, and fertilizing the soil and in planting that tend to improve production materially.

Vegetable crops in relation to soil fertility.—II, Vitamin C and nitrogen fertilizers, S. H. WITWER, R. A. SCHROEDER, and W. A. ALBRECHT. (Mo. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 4, pp. 329-336, illus. 1).—In this second paper (E. S. R., 92, p. 207) evidence is presented of an inverse relationship between the concentration of vitamin C in plant tissue and the nitrogen supplied as fertilizer, together with the usually positive correlation between nitrogen applications and yields of spinach and Swiss chard. When the concentrations of ascorbic acid were high in spinach, those of nitrogen and magnesium were low. Neither potassium nor manganese showed any connection with vitamin C. The concentrations of calcium and phosphorus were parallel with those of ascorbic acid.

Asparagus production in the lower South, with special reference to time and length of cutting season, M. T. DEONIER and G. P. HOFFMAN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 413-417).—The results of a 5-yr. study of a Mary Washington asparagus planting at Meridian, Miss., showed even with the best of cultural care and limited cutting unmistakable signs of progressive ex-

haustion at the end of the period. The marketable yield held up best on plots harvested for only a 4-week period in the spring. In conclusion, the authors assert that yields and quality of the product do not appear high enough to be profitable over an extended period. Under conditions of south-central Mississippi small quantities of asparagus can be grown in farm gardens, but the crop is not recommended for commercial production.

**Effect of shearing on performance of beet seed.** P. WORK. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 418-420).—This paper was covered from another source (E. S. R., 92, p. 788).

The effect of spacing and number of kernels per hill on sweet corn yields, B. S. PICKETT. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 421-424).—Experiments with Ioana sweet corn showed that under the 1944 spring growing conditions prevailing in the lower Rio Grande Valley of Texas, the method of planting had little effect on the total yields. Rate of planting did on the other hand influence greatly total yield and ear size and suggested that a spacing of 2 sq. ft. per plant produced the maximum yield of marketable corn per acre. Satisfactory ear size may be obtained at stand levels as high as 22,000 plants per acre, which is equivalent to one plant every 8 in. of lineal 3-ft. row. Good yields may be obtained from somewhat wider spacing, perhaps one plant per 3 sq. ft. of area. From the standpoint of seeding efficiency the single seed drop method is superior to the hill method and should probably be used for the sweet corn crop.

**A comparative study of onion varieties in relation to bolting and yield when grown from sets.** M. HOLDSWORTH (*Ann. Appl. Biol.*, 32 (1945), No. 1, pp. 22-34, illus. 8).—In two trials each of 25 varieties tested during two seasons and the intervening winter storage, sets produced in the first season were grown to maturity in the second. Among those tested certain varieties bolted little and gave high yields. Efforts were made to maintain and increase these desirable strains. Late planting of sets tended to decrease bolting, but the resulting yields were reduced materially. Plants from large sets tended to bolt more readily than those from small sets. In general the highest gross yields were obtained from large sets of nonbolting kinds, but for highest yields of bulbs free from flower stalks small sets should be used for all varieties. During storage the large sets lost less percentage weight than small but they sprouted much more freely. Long storage was undesirable, because sprouting and weight losses increased rapidly during late spring.

**Starter solution and various hormones tested for effect on onion transplants.** W. C. SPARKS (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 2, pp. 11-12).—A comparison of four hormone treatments with a starter solution consisting of 1 lb. of a 4-12-4 fertilizer dissolved in 10 gal. of water and applied at the rate of  $\frac{1}{2}$  pt. per plant at the time of transplanting showed that the starter treatment was the only one that increased yields significantly above the controls. Furthermore the bulbs from the starter solution treatment were significantly larger than those of any other treatment or the check.

**The species *Pisum sativum* in relation to Australian agriculture.** Y. AITKEN and J. M. HAUGHTON (*Jour. Austral. Inst. Agr. Sci.*, 11 (1945), No. 1, pp. 35-40, illus. 1).—Rotation trials at the Waite Institute showed *P. sativum* to be the outstanding forage crop for use in a fallow-wheat-forage crop-pasture rotation. The need is indicated for varieties with a shorter growing season to escape drought and insects. There is opportunity for breeding work which would utilize source material from the wide natural range of the species rather than simply recombining existing agricultural varieties.

**Boron supply in relation to carbohydrate metabolism and distribution in the radish.** P. N. SCRIPTURE and J. S. McHARGUE. (Ky. Expt. Sta.). (*Jour. Amer.*

*Soc. Agron.*, 37 (1945), No. 5, pp. 360-364).—A concentration somewhere in the range of 0.25 to 0.50 p. p. m. of boron was indicated as optimum for the radish, as measured by yield of both roots and tops. A treatment of 5.0 p. p. m. of B was slightly toxic and reduced slightly the weight of tops and roots. There was no noticeable difference in quality of the roots within the range utilized.

Direct reducing sugars, sugars hydrolyzed by invertase, and alcohol-insoluble carbohydrates hydrolyzed by normal  $H_2SO_4$  were present in excessive amounts in plants grown without added B. The amount of B added had little effect on these materials so long as enough was present for good growth. Direct reducing sugars were lower in the roots of B-deficient plants than in those receiving the required amount of B. The authors conclude that B must be functional in the metabolism and translocation of carbohydrates.

Preliminary report on resistance to disease of certain tomato lines and varieties, H. H. FOSTER (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 4, pp. 1, 8).—Observations at Crystal Springs are presented on many new varieties and strains of tomatoes received from various sources, including the U. S. D. A. Regional Vegetable Breeding Laboratory at Charleston, S. C., and the Indiana, Missouri, Nebraska, and Ohio Experiment Stations, as well as lines developed by the Mississippi Station. Since the 1944 season was severe on tomatoes, with at least seven diseases present, an unusual opportunity was afforded to study comparative behavior. Much of the material under observation was in the formative stage, and considerable more selection and crossing work will be required before desirable horticultural characters such as market size, uniform shape, etc. are attained.

Should tomato plants be pruned and staked? T. M. CURRENCE (Minn. Expt. Sta.). (*Minn. Hort.*, 73 (1945), No. 6, pp. 84-85, illus. 3).—The yields of (1) unstaked and unpruned, (2) staked but not pruned, and (3) staked and pruned tomato plants were 16.62, 15.96, and 11.77 tons per acre, respectively. When early yields (first five pickings) were considered, the respective figures were 1.33, 1.41, and 1.57 tons. Furthermore the fruits on the pruned and staked plants averaged larger in size.

The extraction of auxin from tomato fruit, W. P. JUDKINS. (Ohio Expt. Sta.). (*Amer. Jour. Bot.*, 32 (1945), No. 5, pp. 242-249, illus. 1).—The use of ethanol as a solvent in the extraction of auxin from fresh tomato tissue gave higher yields than ether, acetone, methanol, dioxane, or ethyl acetate.

A number of successive extractions of the same sample of tissue were necessary to obtain all the extractable auxin with ethanol, ether, or acetone. The extraction of auxin from dried tomato tissue by the use of water at pH 11.8 for 18 hr. at 26° C. gave higher yields than any other method tried or reported in the literature. When the above extract was adjusted to pH 5.8 and extracted with ether, the yield of auxin was further increased. The more rapidly the tomato tissue was dried in preparation for the above extraction technic, the higher was the resulting auxin yield.

The hormone content per gram of fresh tissue of the tomato fruit was highest during the early part of the season when the plants were growing vigorously.

The use of chymotrypsin in the extraction of the auxin from dried tomato tissue gave yields equal to, or slightly lower than, water at pH 11.8. Papain was approximately one-half and trypsin one-fourth as effective as chymotrypsin.

The Blacklee watermelon, M. N. WALKER. (Fla. Expt. Sta.). (*Seed World*, 57 (1945), No. 10, pp. 12, 14, illus. 2).—Developed from a cross between the Hawkesbury and Leesburg varieties, both highly resistant to fusarium wilt, the Blacklee is itself highly resistant and has admirable appearance and edible quality. In a test in 1944 on *Fusarium*-infested soil 90 percent of the Blacklee plants were free of wilt at harvesttime, whereas only 43, 17, and 14 percent, respectively, of

Watson, Cannon Ball, and Stone Mountain were alive. Blacklee is proving desirable in commercial fields.

Some effects of the early spring season of 1945, M. A. BLAKE (*Hort. N.J.* [N. J. State Hort. Soc.], 26 (1945), No. 4, pp. 1712-1713, 1714, illus. 5).—The unusually warm March of 1945 brought many fruits into abnormally early bloom and growth. The author reports on the behavior of various horticultural varieties of peach, apple, and ornamental plants and shows how some endured better than others at low temperatures following blooming.

Sampling methods for the measurement of fruit crops, S. C. PEARCE (*Jour. Roy. Statist. Soc., n. ser.*, 107 (1944), No. 2, pp. 117-126).—The author shows that it is possible to estimate the weight of an apple or plum crop with very fair accuracy by counting the number of boxes or baskets into which it is picked. A discussion is included on methods of computing, and the least number of sample containers that need to be actually weighed.

Methods are given for estimating the mean size of fruit in crops of apples, pears, and plums for the examination of treatment differences. For apples it is recommended that a sample of 0.75 bu. be divided equally between the tops of complete stacks of 3 bu., for pears that a similar sample be divided between all full bushel boxes, and for plums that a sample of 60 fruits be divided between three containers chosen at random.

Standards for judging the growth status of apples in New Jersey, M. A. BLAKE, L. J. EDGERTON, and O. W. DAVIDSON (*New Jersey Stas. Bul.* 715 (1945), pp. 36, illus. 15).—Three tree characters—spur leaves, dormant fruit buds, and 1- and 2-year-old growth—were employed as the basis for three standards by means of which the growth status of bearing-age trees of several varieties of apples may be estimated.

It was found that the potential fruitfulness of the tree and the size of fruit buds for the following year could be rather accurately predicted on the basis of spur leaf measurements in summer. A New Jersey summer growth status standard based on spur leaf characters is the means provided the grower for estimating tree condition during the growing season.

Dormant spur buds of several varieties of apples from different orchards were measured and sectioned to determine the relationship between diameter and presence of floral parts. On the basis of these data a dormant fruit bud standard of four size classes was initiated for these varieties.

Spur buds of the different classes were also selected on bearing trees of five varieties in several orchards, and their performance in flowering and in setting and producing fruit was recorded. Class 1 and 2 buds developed the largest number of flowers, the highest percentage of fruit set, and the best yields of apples for all varieties studied. Class 4 buds bloomed in some instances but few of them matured fruit of any commercial value.

A correlation was found between the length and diameter of the 1- and 2-year-old wood growth and the potential fruitfulness of the tree. A standard for estimating the growth status of Delicious, Stayman, and McIntosh in New Jersey by means of this annual and 2-year-old growth is provided.

Certain additional tree characters are of value and should be used in estimating tree growth, composition, and fruitfulness. Among these are: The flowers, the color of bark of dormant 1- and 2-year-old wood growth, and the size, finish, texture, and quality of the fruits.

The three standards—spur leaves, dormant spur buds, and annual and 2-year-old wood growth—together with the other tree characters mentioned, form a basis for judging tree growth and composition at all seasons.

Clustering habit in Wealthy, Haralson, and Minjon apples, W. G. BRIERLEY. (*Minn. Expt. Sta.*) (*Minn. Hort.*, 73 (1945), No. 5, pp. 74-75, illus. 2).—The

habit of bearing fruit in clusters rather than singly was studied in the new Minnesota station varieties, Haralson and Minjon, with Wealthy as a comparison. In Haralson 55.8 percent of the spurs set single apples, while in Minjon only 21.9 percent set single fruits. Thinning of the fruit is deemed a necessary practice in all three of the varieties.

**Some varietal aspects of Australian apple production,** F. T. BOWMAN (*Jour. Austral. Inst. Agr. Sci.*, 11 (1945), No. 1, pp. 16-23, illus. 1).—Herein are presented the results of a production survey of apple varieties grown in Australia. The leading variety was Jonathan, followed in order by Sturmer, Granny Smith, and Cleopatra. These four varieties comprised 58 percent of the entire apple production.

**A second report on some lethal rootstock-scion combinations,** J. K. SHAW and L. SOUTHWICK. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 198-202, illus. 3).—Observations on the growth and behavior of scions of 25 varieties and strains of apple budded on USDA clonal rootstock Spy 227 showed striking differences in response. In the first season the ratings were from very poor to excellent, and in the second year all those that rated very poor to fair in the first season succumbed. Surprisingly, a few like Blaxtayman made excellent growth the first year and failed the second season. Certain of the varieties and strains that failed on Spy 227 have grown vigorously on two clones, Spy 227-2 and Spy 227-12, both derived from seedlings of Spy 227.

In 1942 buds of two McIntosh strains, G and R, were inserted on own-rooted Virginia Crab layers. Growth the first year was comparable, but in the second season the R trees made less growth, but there was no evidence of ill health. The possible causes of the failure of trees on Spy 227 are discussed without positive conclusions. So far there is no evidence that there is a communicable disease involved.

An earlier paper was noted (E. S. R., 92, p. 210).

**Temperature as a factor in breeding peaches for a mild climate,** S. H. YARNELL. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 239-242). A number of peach varieties were rated on an adaptability-to-mild winters scale, ranging from poor at 0 to good at 10. Among the promising varieties were Babcock 8, Honey 10, Pallas 10, and Smith 10. Rating a small progeny of Dr. Burton 3 X J. H. Hale 2, it was evident that the seedlings fell largely in the range of their parents. Seedlings of Hiley 7 X Honey 10 rated high, indicating further that winter adaptability is based on genetic factors.

When crosses were made between varieties of different times of bloom, the seedlings were again intermediate between the parents. More important from the breeder's angle was the fact that there were trees with a high adaptability rating that did not reach full bloom until late in March. Apparently both adaptability to winter and time of bloom were genetically controlled, but fortunately by distinct factors or genes.

In the spring of 1943, a temperature of 17° F. occurred at College Station, Tex., when a group of seedlings of commercial varieties X Honey were expanding their flowers and a few trees were in full bloom. Yet 27 of the 143 trees produced 30 lb. or more of fruit. A total of 21 of the 27 trees had a rating of 8 or above in adaptability to winter. It was evident, therefore, that peaches which need little winter cold to make them bloom are not necessarily less hardy in the bud than those which require more hours of chilling. The author believes that definite progress has been made toward the objective of combining minimum winter chilling requirements, late blooming, and cold hardiness of the flower buds in a single variety.

**Some methods used in breeding peaches in New Jersey,** M. A. BLAKE (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 220-224).—The author

discusses the development of the peach breeding program at the New Jersey Stations, pointing out its objectives, methods for attaining these objectives, and accomplishments. At the present time approximately two-thirds of all the peach trees growing in commercial orchards of New Jersey consist of varieties developed in the station breeding program. In addition to this practical outcome, much information has been acquired as to inheritance of various characteristics in the peach tree and fruit, desirable parental varieties, how to test seedlings rapidly, etc.

Variations in type and germinability of commercial lots of peach seed used by the nursery trade, H. B. TUKEY. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 203-210, illus. 1).—Observations on a total of 187 samples of peach seeds obtained from various States showed a marked variability in type. The so-called "naturals" from the southern Appalachians were relatively uniform in size and appearance. Most of the other material varied widely. Germination data on the 187 lots show a range from 0 to 100 percent, with a total of 99 samples 50 percent or lower and only 12, 90 percent or above. There appeared to be no location providing seed of uniform viability. External appearance proved no certain criterion of quality, and seed of the current season proved, in general, no better than that 1-year-old. One lot which had been in storage for 5 yr. germinated 66 percent. There were indications that the manner of handling peach seed after removal from the fruit may be important in maintaining viability. Some of the characteristics of the pits and seed of the Lovell and Muir peaches are described because of increasing dependence of eastern nurserymen on these California-grown varieties.

The excised-embryo method of testing the germinability of fruit seed with particular reference to peach seed, H. B. TUKEY. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 211-219, illus. 4).—This paper presents data covering the author's experiences with the excised-embryo method over a 10-yr. period and giving comparative figures for the same lots of seed tested by the excised-embryo and after-ripening methods and certain information on the excised-embryo technic. Germinations obtained by the two methods were in general agreement, with the excised-embryo giving higher values in 13 and slightly lower values in 5 of 30 comparisons with peach seeds. In 10 of the 12 instances of equal values there was no germination. Comparable results were recorded with mahaleb cherry, myrobalan plum, apricot, pear, and apple.

Characteristics of the progeny of certain peach varieties, J. H. WEINBERGER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 233-238).—As an aid to peach breeders, a summary is presented of the progeny behavior of 23 crosses and 4 selfs with relatively large populations. Characters considered include blossom type, time of bloom, bud set, time of fruit ripening, size and form of the fruits, pubescence, skin and flesh color, firmness of flesh, adherence of flesh to the pit, and edible quality. Allowing for the influence of early ripening on clingstone behavior Fireglow, Dixigold, Halehaven, Cumberland, July Elberta, Muir, and Sunbeam carried strong factors for freestone. Certain freestone varieties such as Hiley, Early Elberta, J. H. Hale, and Belle carried factors for clingstone as well as freestone. As to quality Rochester, considered as excellent, transmitted this characteristic to a large percentage of its seedlings obtained from crosses with other varieties. Halehaven, Oriole, Maxine, and Veteran carried also factors for good quality. The occasional appearance of fairly desirable seedlings from crosses between mediocre parents is considered indicative of the heterozygous nature of the peach.

Peach orchard grown in sod, C. W. ELLENWOOD and C. FRYMAN (*Ohio Sta. Bim. Bul.* 234 (1945), pp. 93-95).—Observations in a peach orchard established in 1932, conducted 2 yr. under the clean cultivation system of soil management and

since that time in sod with heavy nitrogen applications, indicated that peaches may be grown successfully by this system. Of the three varieties planted, namely, Elberta, Golden Jubilee, and J. H. Hale the last was least hardy and was practically eliminated by a severe winter. Elberta and Golden Jubilee appeared about equally hardy in the wood, but Golden Jubilee proved superior to Elberta with respect to fruit bud hardiness.

**Tree-conditioning the peach crop: A study of the effect of thinning and other practices on size and quality of fruit, M. J. DORSEY and R. L. McMUNN (*Illinois Sta. Bul. 507* (1944), pp. 321-425+, illus. 22).**—The peach tree produces fruit buds far in excess of the number necessary for a crop. Pruning in the moderately heavy manner practiced in Illinois removes from one-fourth to one-half the total fruit buds. Other factors such as winter killing, frosts during bloom, and natural fruit dropping also reduce the fruit set, so that in one commercial orchard there were only five crops during 17 years that required fruit thinning after the drops were over.

Studies of peach fruits from bloom to maturity showed that while growth occurs in three distinct phases, it is continuous, the fruit enlarging as long as it remains attached to the tree.

When adjusting the crop to the tree, the grower must keep in mind that a given yield may consist of either a large number of small peaches or a smaller number of large peaches. In the latter case there will be fewer peaches to pick and fewer fruits will be needed to fill the container. The proportion of flesh will be greater and the proportion of stone less in a given weight of large peaches than in the same weight of small peaches.

Of three methods of thinning, (1) distance thinning, (2) according to fruit-leaf ratio, and (3) according to the total load on the tree, the last is recommended because it is most practical. It is suggested that the total crop load to be left on the tree after thinning be checked by the other two methods.

In Illinois, with the crop load limited as it is by pruning and dropping, it was found advisable to delay fruit thinning until after the June drop. The response in growth rate of fruits after thinning was neither immediate nor pronounced, with the effect of an excess crop becoming most acute during the final fruit swell.

The results of various combined treatments of nitrate applications, pruning, and severity and time of thinning indicated that an overload of fruit cannot be corrected by any of the cultural combinations tried, and that thinning the fruit was a necessary supplement. Small fruits, obtained during dry seasons, suggested that deficient soil moisture ranks with an excess load of fruit in its capacity to reduce fruit size.

The importance of the final swell was shown in the fact that peaches left on the tree increased in volume about 25 percent after the earliest picking date observed.

Peaches picked green ripe, firm ripe, and tree ripe lost weight in storage at about the same rates. Fruits harvested tree ripe were shipped successfully to distant markets in precooled cars.

The condition known as soft suture was corrected in part by fruit thinning. Soft suture was most severe on overloaded trees when the moisture supply was low and the temperature was high.

**The beach plum in Massachusetts, J. S. BAILEY (*Massachusetts Sta. Bul. 422* (1944), pp. 16, illus. 14).**—General information is presented on the importance and distribution of the beach plum, habits of growth, characteristics of the fruit, soil preferences, propagation, pruning, pollination needs, insect and plant disease problems, spray schedules, etc.

In a fertilizer trial conducted at Sandwich, Mass., a single treatment of 5-6-4 material applied on May 27, 1942, resulted in a very good set of fruit while non-fertilized plots set very little fruit. In 1943 the treatments were repeated on the same plots with a cottonseed meal plot added. The crop was a failure that season, but the fertilized plants bore a light set of fruit and the leaves were a darker green in color.

**Influence of growth-regulating chemicals on blackberry fruit development,** P. C. MARTIN and E. M. MEADER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 293-299, illus. 1).—Four compounds, indoleacetic acid, indolebutyric acid,  $\beta$ -naphthoxyacetic acid, and 4-chlorophenoxyacetic acid, were tested by the liquefied-gas aerosol method, while  $\beta$ -naphthoxyacetic acid alone and in mixture with 4-chlorophenoxyacetic acid was tested in aqueous sprays on plants of a somewhat unfruitful blackberry seedling selection. A significant increase over the controls was obtained in berry weight with all treatments. In all but one case an application on May 26, when 50 percent of the flowers were open, gave a significantly greater increase than similar applications made June 6, when all but 5 percent of the flowers had opened. An increase in berry weight of 99 percent resulted from treatment with an aqueous spray application of 40 p. p. m. concentration of a "hormone" mixture of 40 percent 4-chlorophenoxyacetic acid and 60 percent  $\beta$ -naphthoxyacetic acid. Treatments noted stimulated the development of the receptacle and of the pulp of the individual drupelets and increased the number of drupelets and seeds per fruit; but many of the seeds were small and undeveloped, so that the ratio of seed weight to fresh-berry weight was actually less in treated fruit than in controls.

**The effect of micro-elements on the red raspberry in coastal British Columbia,** G. H. HARRIS (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 300-302).—Cuthbert raspberries planted in 1938 were treated in the springs of 1941 and 1943 with borax, copper, manganese, and zinc sulfates at the rates of 50, 30, 50, and 15 lb. per acre, respectively. In the intervening year of 1943, all plots received only the basic 5-10-5 fertilizer treatment. Yields were very uniform during the 3 yr., 1941, 1942, and 1943. An average of the 3 years' results shows that manganese was the only microelement to give a significant increase in yield. The carbohydrate content of the juice was increased by applications of manganese and zinc. Borax increased carbohydrates but not enough for significance at the 5-percent level. Boron and manganese increased the vitamin C content of the fruits in all 3 yr. Dry weight of the berries was increased significantly by boron in 1942 and by manganese and zinc in 1941 and 1943. Copper had no effect on yield, carbohydrates, vitamin C, or dry weight.

**Propagating blueberries from hardwood cuttings,** C. A. DOEHLERT (*New Jersey Stas. Cir.* 490 (1945), pp. 8, illus. 4).—Information is presented on the most desirable type of wood for cuttings, the handling of the cutting wood prior to setting in the bed, best time for taking cutting wood, location and construction of propagating beds, setting of the cuttings in the beds, fertilizing the cutting beds, and handling the rooted plants.

**Mulch versus clean cultivation as affecting vineyard performance,** C. A. MAGOON, I. W. DIX, and J. R. MAGNESS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 280-282).—Beginning in the fall of 1937 own-rooted vines of Concord, Delaware, and Ontario grapes were mulched with corn stover applied annually to a depth of 6 to 8 in. and to a width of 18 to 24 in. on each side of the row. For comparison certain plots were clean cultivated. Yield data showed that these varieties produced 67, 22, and 100 percent more fruit, respectively, under clean culture than when mulched with corn stover. The amount of new wood growth was consistently slightly higher where mulch was used but not significantly so. In

the case of total dry matter, Concord and Ontario produced significantly greater amounts with clean cultivation. With Delaware, the differences in favor of clean culture were hardly significant. There was some increase in berry moth infestation in the mulched plots.

**Relationship of solids and ratio to timing of oil sprays on citrus,** W. L. THOMPSON and J. W. SITES (Fla. Expt. Sta.). (*Citrus Indus.*, 26 (1945), No. 5, pp. 6-8, 14, illus. 6).—Oil sprays applied after August 1 either delayed or prevented the formation of maximum solids, especially during the early portion of the harvest period. During some years the ratio of solids to acids in Pineapple oranges picked from trees sprayed after August 1 was lower than in fruits picked from trees sprayed in June or July. Early spraying with oils is particularly important for those varieties that normally have low solids and in varieties the fruit of which is to be moved early in the season.

**Insects and diseases of the pecan in Florida,** A. M. PHILLIPS and J. R. COLE (Coop. U. S. D. A.). (*Florida Sta. Bul.* 411 (1945), pp. 62, illus. 43).—General information is presented on the various insects and plant diseases that attack the pecan in Florida and on materials, methods, and equipment used in their control. This supersedes Bulletin 147 (E. S. R., 39, pp. 553, 557).

**More new varieties of garden chrysanthemums,** L. E. LONGLEY (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 2 (1945), No. 3, p. 14).—Further information (E. S. R., 92, p. 792) is presented on the two new varieties of chrysanthemums, Aurora and Maroon 'n Gold, originated by the station in its program which has resulted in 19 named varieties.

**Plants of the rose family in North Dakota,** O. A. STEVENS (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 4, pp. 27-29, illus. 3).—Brief descriptive notes are presented on a number of plants including true roses, cinquefoil, *Geum* spp., raspberry, *Spiraea*, hawthorns, sand cherry, wild plum, and bird cherry.

**Reducing damage to trees from construction work,** M. E. FOWLER, G. F. GRAVATT, and A. R. THOMPSON (U. S. Dept. Agr., *Farmers' Bul.* 1967 (1945), pp. 26+, illus. 14).—Pointing out that advance planning is desirable for tree protection that will be needed in postwar construction of roads and buildings, this publication offers information that will be helpful to contractors, highway engineers, home owners, and others in preventing or reducing damage to trees. Among the provisions discussed for protecting trees are the gradual thinning of wooded areas, the preservation of natural soil fertility by conserving topsoil and leaf litter, provisions for air and water movement when preparing a fill over tree roots, use of terraces to protect roots when lowering grades, protection of trees by barriers, prompt treatment of wounds, care in locating roadways to preserve valuable trees, the provision of proper clearance for overhead wires, etc. Although it may be possible to repair certain types of injuries to trees, it is usually more economical to prevent damage than to correct it.

## FORESTRY

**Shelterbelts in the Great Plains,** J. W. KELLER (U. S. Dept. Agr., *Soil Conserv.*, 10 (1945), No. 12, pp. 259-263, illus. 4).—The author discusses the history of shelter belt planting in Europe and North America, the planting and care and functioning of shelter belts, some of the limitations, and other necessary conservation practices such as crop rotations, contouring, development of farm ponds, etc., that should go along with shelter belts in making a successful agriculture.

**Value of potassium feldspar as a fertilizer in forest nurseries,** S. A. WILDE and R. O. ROSENDAHL. (Wis. Expt. Sta.). (*Jour. Forestry*, 43 (1945), No. 5, pp. 366-367, illus. 1).—Ground feldspar proved to be a satisfactory source of potassium for jack pine and red pine seedlings growing in quartz sand cultures,

although the concentration of K in the tissues of the feldspar-supplied plants was considerably lower than in the case of seedlings grown with potassium chloride. The application of pulverized K-bearing minerals or rocks to forest nursery soils is apparently an economical method of supplying K. There was no difficulty in grinding rocks to the desirable mesh (40-80) with existing quartzite mills. Lime-stone grinders of the hammer type would probably be damaged by feldspar or similarly hard minerals.

**Response of shortleaf and pitch pines to soil amendments and fertilizers in newly established nurseries in the Central States.** J. T. AUTEN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 12, pp 405-426, illus. 4).—Soils newly changed in use from growing farm crops to growing pine seedlings commonly present the following difficulties: Too high pH—it should be below 6.5, poor drainage resulting from destruction of natural soil structure by leveling operations, too little and the wrong kind of organic matter, lack of mycorrhizas, and sometimes too low levels of available mineral nutrients.

Five years' experimentation on the soils of three newly established pine seedling nurseries, located one each in Ohio, Indiana, and Missouri, are summarized as follows: (1) Surface alkalinity accompanied by soil crusting from concentration of calcium salts was corrected with peat treated with a quantitatively determined volume of dilute sulfuric acid (2) Sodium nitrate, ammonium sulfate, soybean meal, and dried blood all caused severe damping-off when applied at seedling time. Ammonium sulfate and sodium nitrate applied 2 and 4 weeks after seedling emergence did not cause reduction in seedling density. (3) Peat applied at the rate of 4 tons per acre and worked into the soil before seeding time resulted in higher seedling density and increased height. (4) Absence of inoculation of seedling roots with mycorrhizas cannot be compensated for by mineral fertilizers although it may seem to be partially so by soluble phosphates. (5) Neither potassium nor any of the minor elements was consistently effective in causing greater seedling density; none of them increased seedling height.

Rock phosphate in large quantity caused a trend toward increased seedling height, but the average gains were inconclusive. Soluble phosphate stimulated height growth and sturdiness of shortleaf and pitch pine seedlings.

**Reproduction of upland conifers in the Lake States as affected by root competition and light.** H. L. SHIRLEY. (U. S. D. A.). (*Amer. Midland Nat.*, 33 (1945), No. 3, pp. 537-612, illus. 20).—Nursery studies in the Chippewa National Forest in north-central Minnesota indicated that at least 20 percent of light is necessary for the satisfactory establishment and growth of seedlings of red, white, and jack pines and white spruce. Maximum height growth occurred in 43 or 46 percent light. Maximum dry weight was attained in the four species, respectively, with 98, 43, 46, and 98 percent light.

Studies with the same four species in an aspen area, where one plot was cut clean, a second had 36 percent of the basal area removed, and the third was uncut, showed germination, first-year seedling survival, and dry weight of seedlings and transplants to increase with increase in light intensity. The survival of transplants and subsequent survival of seedlings was better on the shaded plots. Red pine grew faster than white pine or white spruce where competition of other vegetation was reduced by weeding and by cutting or trenching.

A similar trial in a stand of jack pine thinned to different degrees showed the best germination and survival of seedlings and transplants to be under the densest overstory. Height, dry weight, and stockiness increased with increasing light intensity. Of the four species, jack pine was most sensitive to reduced light.

Based on the experimental results and general observations, the author concludes that the possibilities of pine seedlings invading established aspen stands with suc-

cess within a reasonable period of time are remote. In all types of stands the success of coniferous reproduction was dependent chiefly upon the absence of intense competition with the subordinate vegetation. The shade and root competition of the overstory trees appeared of secondary importance.

The ability of the four species to survive in dense shade increases in the order of jack, red, and white pines, and white spruce.

**Reforestation in the spruce type in the southern Appalachians**, L. S. MINCK-LFR. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 5, pp. 349-356, illus. 2).—Studies of methods of restoring soft woods such as red spruce and southern balsam firs to some 1,500,000 acres of southern Appalachian forest lands, from which these desirable species have been eliminated by complete cutting and subsequent fires, led to the recommendations that typical spruce sites characterized by relatively shallow organic soils, moist to wet conditions, a tendency toward podsolization, and a moderate to heavy vegetative cover, should be planted to red spruce, and that red pine should be reserved for drier, more exposed areas with a relatively deep mineral soil and sparse to moderate vegetation.

Sites with dense herbaceous and shrubby vegetation and with young hardwoods need release before planting and after establishment. Large planting stock would be better on sites with extreme conditions of herbaceous and shrubby cover. Release treatments would be necessary.

Severe rocky sites with thin soil and sparse vegetation may be successfully planted or seeded in the soil pockets. Here the first objective would be the production of seed-bearing trees. It is suggested that nature, left unaided, might require 500 to 1,000 yr. or more to replace the forests.

**Natural regeneration of shortleaf pine in the Missouri Ozarks**, F. G. LIMING. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 5, pp. 339-345, illus. 3).—The productivity of some 5 to 6 million acres of forest land in the Missouri Ozarks, exclusive of about 1 million acres now adequately stocked with pine, could be materially increased by raising the proportion of shortleaf pines. Studies in the Mark Twain National Forest showed that ground preparation had no significant effect on height growth of pine seedlings, and only one treatment, namely, cultivation after litter removal, had any significant effect on seedling establishment. Reduction of the hardwood overstory had no significant effect on the catch of seedlings at the end of the first growing season, but did enhance the survival of seedlings after the first year. The seedlings under the reduced overstory were taller and better developed under the reduced overstory. Girdling was found superior to cutting as a means of reducing the overstory. In fact, reduction of the overstory was more effective than ground preparation in increasing the natural regeneration of pine. On areas that have a seed supply of at least 1 lb. of viable seed per acre, the stocking of pine in the next stand can be regulated by controlling the density of the overstory. Seed production of small existing pine trees is apparently very low and constitutes an important limiting factor in natural regeneration of the species.

**Diameter growth of southern bottomland hardwoods**, H. BULL. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 5, pp. 326-327).—Data are presented on the average 10-yr. diameter at breast height growth of 12 bottomland hardwoods of sawlog size growing in mixed stands at Stoneville, Miss.

**Effect of the crown on the composition of oleoresin in pines**, N. T. MIROV. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry*, 43 (1945), No. 5, pp. 345-348, illus. 1).—Examination of the oleoresin of young Digger and ponderosa pines showed the Digger oleoresin to develop a deep purple color with Schiff's reagent while ponderosa oleoresin did not. Even when samples of young shoots, needles, and bark were treated with the reagent, the same differential color responses were evident. To determine whether the oleoresin is formed locally from the sugars

or whether some other factors affecting oleoresin formation are supplied from the crown, reciprocal grafts were made between the two species. After 3 yr. droplets of oleoresin obtained from above and below the grafts were tested with Schiff's reagent. The oleoresin from the Digger top grafted on ponderosa pine displayed the usual purple. This was true also for the oleoresin from the ponderosa understock. In the reciprocal grafts, ponderosa top on Digger trunks, no purple color was recorded for oleoresin either from above or below the graft except as the sample was taken near the whorl of Digger branches. Here the color was not as intense a purple as that of the ungrafted Digger pines. The evidence was that oleoresin is formed locally in surrounding living cells.

Chemical changes in beech litter due to infection by *Marasmius peronatus* (Bolt.) Fr., G. C. M. HARRIS (*Ann. Appl. Biol.*, 32 (1945), No. 1, pp. 38-39).—The chemical effects are described with particular reference to the ecological relation between fungus and substrate; beech leaves—some infected and some not—were analyzed and the results compared. A vital process involving loss of carbon was found at work; the fungus decomposed lignin, converting it into soluble products by the action of exoenzymes. It is suggested that by this process it contributes to conditions favoring beech regeneration. The fact that this fungus can more successfully colonize hardwood litter (e. g., beech) than other types of substrate is explainable by considering its physiology.

## DISEASES OF PLANTS

The Plant Disease Reporter [April 15 and 22 and May 1 and 7, 1945] (U. S. Dept. Agr., *Plant Disease Rep.*, 29 (1945), Nos. 13, pp. 327-352, illus. 2; 14, pp. 353-371; 15, pp. 373-393, illus. 1; 16, pp. 395-414).—In addition to brief seasonal survey notes from the Emergency Plant Disease Prevention Project relating to such crops as cereals and grasses, leguminous forage and cover crops, orchard fruits, potato and other solanaceous crops, and vegetables, the above issues contain the following signed notes and articles:

No. 13.—Host-parasite check list revision—*Oryza-Pennisetum* (Gramineae), by F. Weiss; fusarium rots and other storage diseases of potatoes in New York, by R. C. Cassell; diseases of vegetables in northern New Jersey, by A. J. Mix; diseases observed on ornamentals in Missouri greenhouses, by T. W. Bretz; and corn ear rots in South Carolina in 1944, by A. E. Prince.

No. 14.—Crown rust of oats in the coastal bend region of Texas, by G. E. Altstatt; oat rust in Winter Garden area of Texas, by R. D. Watson; diseases on wheat and rye in northwestern Ohio, by A. J. Braun; wheat and barley diseases in southern Illinois, by J. S. Tidd; diseases of wheat and other small grains in southwestern Iowa, by E. F. Vestal; diseases on winter grains in Missouri, by T. W. Bretz; leaf rust and other diseases on wheat in Nebraska, by C. M. Slagg; diseases of small grains in central Texas, by G. E. Altstatt; and fungi isolated from peanuts collected in South Carolina in 1944, by A. E. Prince.

No. 15.—Host-parasite check list revision—*Phalaris-Phragmites* (Gramineae), by F. Weiss; late blight of potatoes in Baldwin County, Ala., in 1945, by G. M. Stone and C. Wilson; freezing injury to peas in Delaware, by J. W. Heuberger (Del. Expt. Sta.); further survey for tobacco downy mildew in South Carolina, by A. E. Prince; and preliminary studies of abacá diseases in Panama, by O. A. Keinking.

No. 16.—Preliminary report on certain tomato lines, selections, and varieties under observation at the Mississippi Truck Crops Branch Station (including tabulated data), by H. H. Foster (Miss. Expt. Sta.); condition of the tomato plant crop in south Georgia, by G. M. Stone; diseases on cabbage and lettuce in South Carolina, by A. E. Prince; a wilt disease of *Crotalaria* and notes on some other diseases in

Mississippi and Louisiana, by D. C. Bain; scab in a Connecticut violet collection, with notes on varietal reaction by K. Thaxter; and diseases of roselle fiber plants in El Salvador, by O. A. Reinking.

[Papers on plant diseases] (*N. Y. State Hort. Soc. Proc.*, 90 (1945), pp. 9-30).—The following are included: Practical Use of Our Newer Knowledge of Apple Scab Control, by A. B. Burrell (pp. 9-16), and Fruit Diseases [in New York] in 1944, by W. D. Mills (pp. 21-30) (both Cornell Univ.); and Results of Field and Greenhouse Experiments With New Fungicides on Orchard Fruits in 1944, by D. H. Palmer and J. M. Hamilton (pp. 16-20) (N. Y. State Expt. Sta.).

The cytology of host-parasite relations, II, M. A. Rice (*Bot. Rev.*, 11 (1945), No. 5, pp. 288-298).—This review (37 references) is a follow-up of the author's discussion of the physiology of parasitism with special reference to rust fungi (E. S. R., 74, p. 648).

Plant viruses and virus diseases, F. C. BAWDEN (*Trop. Agr. [Trinidad]*, 22 (1945), No. 5, pp. 89-92).—This is the substance of two lectures presenting the current status of knowledge of the plant viruses and virus diseases and the author's interpretations thereon.

Viruses described primarily on ornamental or miscellaneous plants, II, P. BRERLEY (*U. S. Dept. Agr., Plant Disease Rptr.*, 1945, Sup. 158, pp. 167-200).—This list, submitted for the subcommittee on ornamental hosts, conforms with the previous compilation of the same title (E. S. R., 91, p. 692) in purpose and treatment, though its scope has been extended to comprise all viruses not specifically assigned to other subcommittees of the committee on virus classification and nomenclature of the American Phytopathological Society. Twenty-four additional viruses are described, and supplementary data are added for 10 viruses previously treated.

The suppression of one plant virus by another, F. C. BAWDEN and B. KASSANIS (*Ann. Appl. Biol.*, 32 (1945), No. 1, pp. 52-56, illus. 5).—Severe etch virus was found to prevent multiplication of potato virus Y and *Hyoscyamus* virus 3 and to replace them even in plants where they had become established. Mild etch reduced the concentration of potato Y but did not suppress it completely. Cucumber virus 1 multiplied normally in mixed infections with any of the three insect-transmitted viruses. The possible implications of these results on the mechanism of virus multiplication is discussed; it is suggested that these viruses inactivate in the cell sap at approximately the same rate as they become denatured in vitro. No differences were found in the stability of antibodies to viruses having different properties.

Polysaccharide production by virulent and attenuated crown-gall bacteria, R. HODGSON, A. J. RIKER, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 89-100).—The isolation, purification, and properties of several polysaccharide preparations from cultures of a virulent and an attenuated strain of *Phytomonas tumefaciens* are described; more was obtained from the virulent cultures. Specific rotations in aqueous and cuprammonium solutions and properties of hydrolysis products indicated that the polysaccharide from the attenuated strain was probably identical with the low molecular weight glucosan produced by the virulent strain. Glucosans produced by the latter from sucrose, glucose, and fructose varied in yield but possessed the same properties as judged by specific rotations—before and after hydrolysis—and reducing sugar content, and hence were considered identical. Very small amounts of polysaccharide material were also formed by the virulent organism from xylose and arabinose; solubilities and specific rotations after hydrolysis suggested that these preparations were also of the glucosan type. Under the experimental conditions the glucosan was not readily utilized by the crown-gall organism as a carbohydrate source; this was also shown by the greater yields of the polysaccharide obtained from older cultures. There are 32 references.

Observaciones sobre royas [Observations on rusts], J. A. FERNANDEZ (*Univ. Repub. [Montevideo], Rev. Facult. Agron.*, No. 36 (1944), pp. 97-112, illus. 12).—Included in this study are *Uromyces lupini*, *Puccinia diichondrae*, *P. poarum*, *P. purpurea*, and *P. maydis*.

Aecial hosts of *Puccinia graminis* in China, L. LING (*Phytopathology*, 35 (1945), No. 6, pp. 417-420, illus. 1).—Among some 50 species of *Berberis* and 15 of *Mahonia* examined in half a dozen herbaria in different parts of China and observed in the field in the western part of Szechuan Province, the author found 12 barberry and 1 mahonia species infected with aecia of *P. graminis*. Among them were 3 species (*B. silva-taurucana*, *B. virgetorum*, and *M. fortunei*) "hitherto unrecorded as carriers and breeders of stem rust"; 3 other species (*B. gagnepainii*, *B. julianae*, and *B. sargentiana*)—considered immune or highly resistant to stem rust in the United States—were severely infected in China. Still another species (*B. dielsiana*)—only mildly susceptible to artificial inoculation in the United States—is usually severely affected by stem rust in the mountain region of Hunan Province, where it is very common.

Razas fisiológicas de *Puccinia rubigo-vera tritici*, comunes en Argentina [Physiological races of *P. rubigo-vera tritici* common in Argentina], J. VALLEGA (*An. Inst. Fitotec. Santa Catalina*, 4 (1942), pp. 40-57, illus. 2; Eng. abs., pp. 53-57).—During 1938-42 races 5, 13, 20, 26, 49, 57, 62, 105, and 114 were found in the Argentine wheat-growing region. From the standpoint of breeding wheats for resistance to leaf rust, the races prevailing in Argentina may be classified into two groups well defined in their pathogenicity and abundance. Group 1 includes races 20, 49, 13, and 26, which are the most abundant and characterized by not attacking the varieties Mediterranean, Democrat, and Sinvalicho; group 2 includes races 5, 62, 57, 105, and 114—all highly virulent to the above varieties. The second group has not generally affected the behavior of cultivated wheats seriously; at least during the period under observation their behavior has depended almost exclusively on their resistance to the first group. There are 28 references.

Observaciones preliminares sobre especialización fisiológica de *Puccinia sorghi*, en Argentina [Preliminary observations on physiological specialization of *P. sorghi* in Argentina], J. VALLEGA (*An. Inst. Fitotec. Santa Catalina*, 4 (1942), pp. 14-16, illus. 1; Eng. abs., p. 16).—Two races were found in Buenos Aires Province—race A inducing only the necrosis reaction on a strain of corn and race B, which proved highly virulent to the same strain.

Unavailability of plant food and take-all of wheat, H. R. ANGELL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 1, pp. 37-46).—In tests carried on in 5-gal. drums of soil outdoors (1941-43), significant differences in the amount of damage by take-all were associated with differences in available plant food. In the second and third seasons a significantly higher percentage of white heads occurred in the drums to which neither chemicals nor inoculum had been added in the first year than in the corresponding inoculated drums with added fertilizing chemicals. The association of white heads and take-all injury in all the drums, with the isolation of *Ophiobolus graminis* from the plants before jointing, was significant. Under the test conditions, addition of nitrate N to the soil had little if any influence on take-all. Small amounts of lime were without effect on the disease; large quantities reduced the effect of take-all, presumably by rendering more plant food available. In the wheat-growing areas, cropping with wheat year after year produces in time the same type of result as was obtained in the second and succeeding years in the control soil used in these tests. The supply of available plant food becomes unbalanced by repeated cropping, the plants fail to grow satisfactorily, and *O. graminis* develops rapidly at the expense of the host during or after jointing.

**Apparent respiration of wheat grains and its relation to a fungal mycelium beneath the epidermis.** T. A. OXLEY and J. D. JONES (*Nature [London]*, 154 (1944), No. 3922, pp. 826-827).—On the basis of the experimental evidence summarized in this preliminary report, it is concluded that the CO<sub>2</sub> produced by stored wheat—apparently by the grain itself—is in fact produced almost entirely by micro-organisms growing in the pericarp (bran) of the grains.

**Charcoal rot of corn and sorghum.** J. E. LIVINGSTON (*Nebraska Sta. Res. Bul.* 130 (1945), pp. 32, illus. 12).—Charcoal rot (*Macrophomina phaseoli*) causes a serious seedling blight and stalk rot of corn and sorghum in Nebraska. In culture the fungus prefers temperatures of at least 35° C., and grows well on a large number of nitrogen and carbohydrate compounds and over a pH range of 5-8. Either low soil temperature or high soil moisture throughout the growing season prevents its occurrence in the State. A soil temperature of 42° proved most favorable for development of seedling blight, whereas 38° was most favorable for the development of stalk rot of mature plants in greenhouse studies. Seedling blight was favored by low soil moisture, and this condition just preceding and during maturity was essential for the development of a high percentage of rotted stalks and the formation of sclerotia. Seedling blight was very low in nonsterile inoculated soil but high in soil steam-sterilized before inoculation. Susceptibility of sorghum varieties to *M. phaseoli* in inoculated soil varied considerably. Growth of the mycelium in the root was intercellular and confined in the early stages to the cortical tissues. There are 26 references.

**Production of "endomitosis" in bean roots and its bearing on the genesis of tumours.** J. C. MOTTRAM (*Nature [London]*, 154 (1944), No. 3922, p. 828, illus. 1).—Endomitosis was found by chance in bean roots allowed to become partially dry. Following up this observation, exposure to a colloidal suspension of benzpyrene and to hypertonic sugar solution also gave rise to this change. From the data presented it is believed that endomitosis and polytene, polyploid, and polynuclear cells are secondary to an increased stiffness of the cytoplasm and no more than signs of such a change. In previous work by the author increased viscosity of the cytoplasm was observed as a common reaction of ciliates to a wide range of tumor-inducing agents, and led to races of multiple organisms.

**Crystallization of southern bean mosaic virus.** W. C. PRICE (*Science*, 101 (1945), No. 2629, pp. 515-517, illus. 2).—Since with all the work done on plant viruses only three have hitherto been isolated in crystalline form, considerable interest is attached to the study here reported, the detailed methods of which are described. The results are said to indicate that southern bean mosaic virus consists of essentially spherical particles small enough and uniform enough to crystallize under appropriate conditions. "The fact that the virus has been crystallized is not considered sufficient evidence on which to decide whether it is animate or inanimate in nature."

**Treat cotton seed.** S. G. LEHMAN (*Res. and Farming [North Carolina Sta.]*, 3 (1945), *1 Prog. Rpt.* 3, p. 5, illus. 1).—Germination and disease tests (1944) on several lots of seed grown in eastern North Carolina indicated that half or more in each lot carried spores of the anthracnose fungus; from past experience, these results are believed to be characteristic of a large part of the cotton seed of 1944, and it is advised that such seed be treated before planting. In a large number of seed treatment tests New Improved Ceresan was found most satisfactory from the standpoints of cost, effectiveness, and availability; 2 percent Ceresan may also be used, but the cost is said to be about twice as much.

**The prevention of seed-borne diseases of flax.** III, The dusting, short wet, and fixation methods of seed disinfection in relation to storage of the seed, J. COLQUHOUN (*Ann. Appl. Biol.*, 32 (1945), No. 1, pp. 34-37, illus. 1).—In further investigations by these methods (E. S. R., 93, p. 44), flax seed with up to 10 percent

moisture was disinfected by a proprietary dry fungicide containing tetramethyl-thiuram disulfide (Nomersan) at 12 oz./cwt. of seed and stored up to 18 mo. without impairment of germinability. Tests were also made on seed samples with moisture contents before treatment of 5.8-13.2 percent and kept in commercial storage after disinfection. These treatments were carried out with an 8-percent solution of Ceresan U 564 at 0.67 and 0.9 gal./cwt. applied by the short wet method, and with the powder Ceresan Ut. 1875A at 12 oz./cwt. applied by the fixation method using 0.9 gal. of separated milk per hundredweight. Results indicated that treatment by either method has the effect of lowering the percentage of viable seeds during subsequent storage, and that the higher the moisture content of the seed before treatment the earlier this effect becomes apparent. It is suggested that seed to be treated by the short wet method on a commercial scale should be dried to contain about 5 percent moisture, that not more than 0.67 gal./cwt. of liquid be applied, and that the seed should not be stored for longer than 3 mo. after treatment. Ten tons of seed were treated on these suggestions with a Kontramix machine, and no ill effects on the crop were observed.

**Especializacion fisiologica de Melampsora lini, en Argentina [Physiological specialization of *M. lini* in Argentina], J. VALLEGA (*An. Inst. Fitotec. Santa Catalina*, 4 (1942), pp. 59-74; *Eng. abs.*, pp. 73-74).**—Studies during 1939-41 indicated the presence of races 19, 20, 22, 42, and 42A, race 19 being the most prevalent. Races 42 and 42A are new and here described, with their reactions on differential varieties. Among all the races thus far known, 42 is said to have the widest pathogenicity among varieties. Comparisons of data on populations in the United States, Germany, Australia, and Argentina show that they differ in individual and common pathogenicity, and that within each geographic population the races have common characteristics indicating their origin. Over 200 strains of flax were tested for rust resistance and the results are tabulated. All local flaxes proved susceptible to the races common in Argentina; among flaxes of fiber, intermediate, or oil types from other countries, a number were outstanding and are listed. The immune flaxes originating in India present the most likely material for breeding work against flax rust.

**"Pasmo" disease on wild flax (*Linum angustifolium*), H. A. LAFFERTY and R. MCKAY (*Nature [London]*, 154 (1944), No. 3918, p. 709).**—A note on the finding of *Sphaerella linorum* and *Colletotrichum linicola* on wild flax in Ireland as shown by studies of the fungus and successful inoculations of cultivated flax.

**Wilt disease of flax in Great Britain, I. M. WILSON (*Nature [London]*, 154 (1944), No. 3918, p. 709).**—A first report of *Fusarium lini* in Great Britain.

**Control de "la mancha" o "Phytophthora infestans" de la papa en Costa Rica [Control of late blight (*P. infestans*) on potatoes in Costa Rica], G. C. KINCAID (*Rev. Inst. Defensa Café Costa Rica*, 15 (1945), No. 123, pp. 94-101, illus. 2).**

**New potato disease of leak type found in Colorado—measures for control listed, W. A. KREUTZER and G. H. LANE (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 2, pp. 3-4, illus. 1).**—A note on a western form of leak disease of potato tubers, first observed in 1941 and apparently caused by soil-inhabiting species of *Phytophthora* which are most active in attack in wet soils.

**The relationship between necrosis and resistance to virus Y in the potato—I, Greenhouse results, E. M. HUTTON and J. G. BALD (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 1, pp. 48-52).**—Hypersensitive necrotic reactions to this virus are described in the seedling progeny of certain potato crosses. It is believed that these reactions will provide field resistance to virus Y in the same way that the Epicure variety is protected against virus X and A. It is postulated that most potato crosses will give a small percentage of the hyper-

sensitive types here described. The hypersensitive reactions to virus Y are apparently heritable, though their mode of transmission is not yet understood.

**Control ring rot with rigid sanitation.** C. J. EINE (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 2 (1945), No. 3, pp. 2-3, illus. 3).—Investigations of bacterial ring rot since its discovery in America in 1931 indicate that "now the answer to ring rot seems fairly clear. It is simply this—if there is ring rot on the farm, sell all the potatoes for table stock, disinfect machinery, sacks, and warehouse, buy clean seed, and keep it clean."

**The influence of crucifers and mustard oil on the emergence of larvae of the potato-root eelworm *Heterodera rostochiensis* Wollenweber.** C. ELLENBY (*Ann. Appl. Biol.*, 32 (1945), No. 1, pp. 67-70).—In hatching tests with cysts of the potato root nematode the effects of potato root excretion mixed—with root excretions of six types of crucifer seedlings were investigated. With cress, white mustard, and black mustard, the emergence of larvae in the mixed excretions was very much less than that from control cysts in potato root excretion alone. On subsequent return to potato root excretion alone, larval emergence was found unimpaired in the case of white and black mustards, but with cress the total emergence differed significantly from that in the control. Similar effects, of both types, were obtained with certain dilutions of allyl isothiocyanate—the mustard oil of black mustard seed—in potato root excretion.

**Virus yellows of sugar beet.** R. HULL and M. A. WATSON (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 52 (1945), No. 2, pp. 66-70, illus. 3).—In most years the sugar beet crop over large areas of eastern England is said to turn yellow in the fall, although in other parts of the country it may remain green until harvested; it is now known that almost all of this yellowing is due to the beet yellows virus and certainly that having such serious effects on the crop during the past two seasons. The principal vectors are the green peach aphid and *Aphis fabae*. The epidemiology and control of the disease are discussed.

**Pineapple disease of sugarcane cuttings and its control.** A. Mc MARTIN (*So. African Sugar Technol. Assoc., Ann. Cong. Proc.*, 18 (1944), pp. 44-46).—This disease—due to *Ceratostomella paradoxo*—is believed to be the most frequent single cause of failure to germinate among sugarcane cuttings in Natal. Good control was obtained in a field test by cutting the cane into lengths prior to planting and treating the cut ends with the fungicidal dusts Ceresan, Agrosan, and Thiosan.

**Informaciones relacionadas con la lucha contra el "carbón" de la caña de azúcar [Information on the control of sugarcane smut].** W. E. CROSS ET AL. (*Rev. Indus. y Agr. Tucumán*, 34 (1944), No. 4-6, pp. 45-91).—Information on control—including resistant and practically immune varieties (annotated lists)—from various sources, with recommendations, and a census of varieties cultivated in Tucuman.

**El "carbon" de la caña y los insectos [Sugarcane smut and insects].** K. J. HAYWARD (*Rev. Indus. y Agr. Tucumán*, 34 (1944), No. 4-6, pp. 96-97).—A note.

**Factors influencing the control of clubroot caused by *Plasmodiophora brassicae* Wor.** J. G. GIBBS (*Minn. Univ., Sum. Ph. D. Thesis*, 2 (1943), pp. 40-42).

**Viruses associated with cabbage mosaic.** J. C. WALKER, F. J. LE BEAU, and G. S. POUND. (U. S. D. A. and Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 70 (1945), No. 12, pp. 379-404, illus. 6).—The cabbage mosaic of the Midwest is shown to consist of two causal virus entities tentatively designated as cabbage viruses A and B; these two were also recovered from diseased plants in western Washington. Studies of the symptoms, host ranges, and physical properties indicate cabbage virus A to be very similar to but consistently distinct from the black ring virus described from California; cabbage virus B is very similar to but in some respects distinct from the cauliflower mosaic virus, also described from California. It is suggested that cabbage virus A, the cabbage black ring virus, and the cabbage ring necrosis

virus are all strains of the turnip virus 1 of Hoggan and Johnson. It is further suggested that the cauliflower mosaic virus of Tompkins be designated as cauliflower virus 1 and that cabbage virus B and the broccoli virus of Caldwell and Prentice be designated as strains thereof.

Transmission of certain virus diseases of tomato by aphids, L. F. BUSI (Minn. Univ., Sum. Ph. D. Theses, 2 (1943), pp. 54-56).

Bacterial canker disease of tomato, C. M. HAENSELER and B. H. DAVIS (New Jersey Sta. Plant Disease Notes, 22 (1945), No. 3, pp. 9-12).—A general discussion of the disease as it occurs in New Jersey—its symptoms, dissemination, and control by use of clean seed.

Nightshade source of tomato infection, L. HAVEN (Seed World, 57 (1945), No. 6, p. 18).—A note on the discovery of *Solanum douglasii* infected with bacterial canker disease of tomato.

The perithecial stage of *Didymella lycopersici*, C. J. HICKMAN (Nature [London], 154 (1944), No. 3918, p. 708).—“This appears to be the first record of the occurrence of perithecia of *D. lycopersici* under natural conditions on the host [tomato].”

Resistance of tomato varieties and lines to southern stem blight, J. L. BOWERS (Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 5, pp. 1, 8).—A large number of tomato varieties and stocks were tested by direct inoculation of young seedlings for resistance to southern stem blight, a plant disease causing serious losses to Mississippi tomato growers. The highest degree of tolerance was found in a line of *Lycopersicon pimpinellifolium*. In this line about one-third of plants survived two inoculations. Certain of the U. S. Regional Vegetable Breeding Laboratory lines also showed considerable tolerance. Under the same conditions commercial varieties as a rule showed little tolerance to the disease. It is planned to continue the investigations in the hope of developing horticultural varieties with satisfactory tolerance.

Turnip mosaic viruses, F. J. LEBEAU and J. C. WALKER. (Wis. Expt. Sta. (Jour. Agr. Res. [U. S.], 70 (1945), No. 11, pp. 347-364, illus. 8).—Comparative studies were made of four virus isolates from turnip (three from Wisconsin and one from Louisiana) with each other and with previously described viruses from crucifers. One of the isolates (T8) corresponded very closely in properties and host range with the strain of turnip virus 1 described as cabbage virus A and with the black ring and ring necrosis viruses from cabbage. The other three (T1, T6, T9) were very similar to T8 in properties and breadth of host range but differed from each other and from T8 in rather important host selectivity. None of the last three viruses infected cabbage, cauliflower, kale, brussels sprouts, or annual stock, though all infected green sprouting broccoli and only T9 infected kohlrabi and dames violet. T8 and T9 infected all species of *Nicotiana* tested and T6 all but *N. rustica*, but T1 failed to infect *N. tabacum*, *N. rustica*, *N. repanda*, or *N. sylvestris*. All four infected petunia, chard, beet, and zinnia; all except T1 infected spinach. It is pointed out that all viruses hitherto fully described from crucifers are infectious also to turnip. The four isolates here described differ in one point or another from each other and from viruses previously described. They are, however, considered sufficiently similar to turnip virus 1 to be regarded as strains thereof and are distinct from the cauliflower mosaic-virus group. There are 24 references.

Isothan Q15, a fungicide for apple spraying compatible with summer oil, R. H. DAINES (New Jersey Sta. Plant Disease Notes, 22 (1945), No. 4, pp. 13-16).—From the results of the 1944 tests, together with information from other experiment stations, it appears that Isothan Q15 (lauryl isoquinolinium bromide) would serve in the “change-over period” (petal fall and early cover spray period) to provide sufficient apple scab protection without involving danger of injury if followed by an oil-containing spray applied for codling-moth control.

Fermate and the control of cedar-apple rust, F. H. LEWIS. (Pa. State Col.). (*Pa. State Hort. Assoc. Proc.*, 85 (1944), pp. 66-70).—"Three applications of Fermate gave excellent rust control in this orchard. Additional sprays on trees not included in the experiment showed that a fourth application, either in the prepink or second cover spray, did not increase rust control. . . . Cedar eradication is still the logical way to control this disease in spite of the fact that the work with Fermate sprays is very encouraging."

Certain aspects of resistance of plum trees to bacterial canker.—I. Some biochemical characteristics of *Pseudomonas mors-prunorum* (Wormald) and related phytopathogenic bacteria, D. ERIKSON (*Ann. Appl. Biol.*, 32 (1945), No. 1, pp. 44-52).—Several strains of *P. mors-prunorum* and *P. prunicola* isolated from lesions on plum and cherry were studied, together with the pathogen of bacterial canker of stone fruits in California (*P. syringae* from apricot) and other pathogenic bacteria from pear and syringa. Comparisons were also made with *Pseudomonas* forms pathogenic to pea, bean, lettuce, and tobacco and with the common saprophytes *P. fluorescens* and *P. pyocyaneus*. Except for two yellow organisms (*Bacterium pruni* and the Pear 8 strain—the latter, however, very occasionally exhibiting fluorescence), all belonged to the green-fluorescent group of *Pseudomonas* (Dowson's Group II). On the basis of their dissimilation of C and N compounds a very close relationship was established between these fruit tree and syringa pathogens of the green-fluorescent group. *P. mors-prunorum* is not highly specialized in nutrient requirements but can satisfy its fundamental C and N needs from a very large variety of simple substances. The only consistent biochemical differentiation shown by *P. mors-prunorum* (including some of the syringa strains) in comparison with *P. prunicola* (including *P. syringae* from apricot and most of the pear strains) was its more rapid production of acid from sucrose. Both *P. mors-prunorum* and *P. prunicola* produce a levan from sucrose, which causes a raised gummy growth on solid sucrose-containing media. This applies also to *P. pisi*, *P. tabaci*, and *P. phaseolicola*, but is not the case with the weakly pathogenic forms—*P. marginalis*, *P. cerasi* (= *P. trifoliorum*, from bean), and the saprophytes—*P. fluorescens* and *P. pyocyaneus*. On the basis of biochemical characteristics—considered apart from host pathogenicity—it is believed there is no justification for erecting to specific rank these various levan-forming green-fluorescent plant-pathogenic forms.

Grapevine injection apparatus, W. O. WILLIAMS. (Univ. Calif.). (*Science*, 101 (1945), No. 2625, pp. 416-417, illus. 1).—The plant injection procedure for diagnosis of mineral deficiencies causing leaf abnormalities is believed preferable in many instances to other types of treatment. Injection into the plant circumvents soil fixation of various ions, requires only a minimum of materials, and gives assurance that the element in question is at least within the plant. An apparatus successfully used for the purpose is described and illustrated.

Cacao and witches' broom disease (*Marasmius perniciosus*) F. J. POUND (*Trinidad and Tobago: Govt.*, 1943, pp. 14+, illus. 2).—This is a report on a visit to the Amazon territory of Peru from September 1942 to February 1943.

Nutrient deficiencies of citrus, H. D. CHAPMAN, S. M. BROWN and D. S. RAYNER. [Calif. Citrus Expt. Sta.]. (*Calif. Citrog.*, 30 (1945), Nos. 7, pp. 198-199, 216-217, illus. 3; 8, pp. 230-231, 246-248, illus. 6).—These installments (E. S. R., 93, p. 162) consider Mn, Zn, and Cu and N, P, and S deficiencies, respectively.

Investigações sobre a "tristeza" dos citrinos.—I, Alterações da pressão osmótica [Investigations of the tristeza disease of citrus.—I, Changes in osmotic pressure], C. M. FRANCO and O. BACCHI (*Bragantia*, 4 (1944) No. 9, pp. 541-551, illus. 2; Eng. abs., p. 551).—In healthy Bahia oranges budded on sour orange stock

the osmotic pressure above and below the union proved to be the same; in diseased plants the pressure below the union was much lower, and the difference in roots of healthy v. diseased plants was still more evident. The osmotic pressure of the leaves of a sour orange seedling was much higher than that of a sweet orange on its own roots ("laranjeira caipira"). The scion appears to induce a change in the osmotic pressure of the stock, sometimes raising it and sometimes lowering it.

A virus disease of *Atropa belladonna*, K. M. SMITH (*Parasitology*, 35 (1943), No. 3, pp. 159-160, illus. 4).—The virus described was found sap-transmissible to tobacco and other Solanaceae and gave good local lesions on *Nicotiana glutinosa* and *Phaseolus vulgaris*. It occurred in fairly high concentration in the plant, withstood ageing in extracted sap for 6-11 days, and was inactivated at 75°-80° C.

A further note on the viruses affecting *Atropa belladonna* and a description of a virus complex attacking *Hyoscyamus niger*, K. M. SMITH (*Parasitology*, 36 (1945), No. 3-4, pp. 209-210, illus. 4).—It is shown that *A. belladonna* acts as a symptomless carrier of *Hyoscyamus* virus I; some symptoms caused by it in other solanaceous plants are described. A spontaneously occurring virus complex in *H. niger* was found to consist of Solanum virus I (potato virus X) and Brassica virus I. During the course of this study it was found that potato virus X forms local lesions on the cotyledons of ridge cucumber without systemic infection, and that Brassica virus I behaves similarly on the inoculated leaves of *Nicotiana sylvestris*.

Diseases of *Fremontia*, H. N. HANSEN and H. EARL THOMAS. (Univ. Calif.). (*Madroño*, 8 (1945), No. 2, pp. 39-42, illus. 1)—*Fremontia* spp.—natives of the southwestern United States—"are highly esteemed by many as ornamental subjects for garden and park and no doubt would be much more widely planted except for certain diseases to which they are susceptible," particularly stem girdle caused by *Phytophthora cactorum*, which is favored by excess water and inadequate drainage. Other diseases here considered are vascular wilt (*Verticillium albo-atrum*), leaf spot (*Hendersonia fremontiae* n. comb.), and angular leaf spot (*Septoria angularis* n. sp.).

Lanolin mixtures as dressings for tree wounds, W. E. McQUILKIN and J. W. SHOWALTER. (U. S. D. A., et al.). (*Arborist's News*, 10 (1945), No. 3, pp. 17-19).—From the standpoints of protection against drying and die-back from wound edges and promoting callus formation, lanolin-rosin-gum mixtures of the type described in this preliminary report are believed to represent a closer approach to Pirone's ideal dressing (E. S. R., 86, p. 785) than any substance now used. With further testing, blends of asphaltum and lanolin may also qualify for inclusion in the same category and, theoretically, incorporation of a general fungicide into a lanolin mixture should present no great difficulty. Tests along this line are the next major step.

Studies in the *Fusarium* damping-off of conifers, I, II, H. TINT (*Phytopathology*, 35 (1945), No. 6, pp. 421-439, illus. 5; pp. 440-457, illus. 8).

I. *The comparative virulence of certain Fusaria*.—In this study of the relative virulence of 25 *Fusarium*s and 4 other fungi used as standards in causing damping-off of conifers, single-spore cultures were made of lines isolated from various parasitic and saprophytic origins, the latter receiving host passage prior to use in inoculation tests. The magnitude of the damping-off losses varied with the several inoculation procedures employed. Of 12 *Fusarium* lines tested on *Pinus resinosa* in liquid culture, 6 caused complete loss, comparing in virulence with a standard line of *Rhizoctonia solani*; the remaining lines exhibited varying degrees of virulence. In inoculation tests with all the lines on *P. resinosa* seedlings in quartz-sand cultures, about half the *Fusarium*s reduced emergence significantly as compared with the uninfected control and all save one caused high postemergence losses. Of the standard lines, *Sclerotium bataticola* failed to reduce emergence but

caused high postemergence losses; *R. solani* effected severe losses in both categories, and *Pythium ultimum* and *Penicillium* sp. neither significantly reduced emergence nor caused postemergence losses. Inoculation tests in sterilized soil cultures gave the most statistically reliable results of the methods employed because of a higher degree of replication available for analysis. The relative virulence of 15 *Fusarium* lines and the 4 standard cultures for a general coniferous population—represented by eight hosts—was determined; conversely, the range of susceptibility of the hosts to the entire group of damping-off fungi was ascertained. A number of the *Fusarium* lines equalled and sometimes exceeded in virulence the cultures of *Pythium* and *Rhizoctonia*, causing reduced emergence and increased postemergence losses. *S. bataticola* caused the least emergence loss but postemergence attack was relatively high. *Pinus resinosa* and *Pseudotsuga taxifolia* were most (and equally) susceptible to both phases of the disease. *Pinus ponderosa* had the least emergence loss and *Picea pungens* the least postemergence loss.

II. *Relation of age of host, pH, and some nutritional factors to the pathogenicity of Fusarium.*—Losses in quartz-sand cultures of *Pinus resinosa* seedlings—inoculated with *Fusarium*s and other standard fungus lines—generally reached their maxima in less than 30 days after emergence. *F. oxysporum* inoculations of various-aged *P. resinosa* seedlings demonstrated a direct correlation between resistance to invasion and increasing age of host. In tests on a single (including autoclaved and unsterilized lots) soil at different pH values, emergence reductions in *P. resinosa*, *P. ponderosa*, and *P. sylvestris* inoculated with *F. oxysporum* and *F. avenaceum* were generally low or moderate in the acid samples and high at pH values above 8. Postemergence damping-off was low in the more acid soils, reached a maximum on the acid side of neutrality, fell off sharply in the autoclaved soil at pH 7.5 and in the unsterilized soil at pH 8.1, and then became uniformly high in the most alkaline substrates. Differences were inconsistent at the various levels of acidity from autoclaved and unsterilized soil samples.

Since chemical variability resulted in the soil samples after induction of reaction differences and steam sterilization, further inoculation tests were performed in quartz-sand cultures in which reaction and ion-variability were independently controlled. Under these conditions, damping-off losses were generally high at all acidity levels, though there was some tendency for increased damping-off with increasing alkalinity. Variation in the constituents of the nutrient solution—under controlled acidity conditions—demonstrated that the influence of nutritional factors on damping-off could be correlated with their simultaneous effects on host and pathogen. The magnitude of the loss was associated with the growth of the pathogen and the degree of susceptibility of the host, measured in terms of succulence. A deficiency of N gave relatively negligible losses; an excess caused early and heavy attack. Deficiencies of Ca and P resulted in high damping-off losses, which were considerably reduced when these elements were present in excess. When K, S, and Mg were deficient, final stands were somewhat higher than with excess of these elements, the latter condition resembling controls grown and inoculated in standard solutions. There are 42 references.

The seasonal development and the defoliating effect of *Cronartium ribicola* on naturally infected *Ribes roezli* and *R. nevadense*. J. W. KIMMEL. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 6, pp. 406-416, illus. 2).—Biweekly examinations of the development of blister rust and of leaf fall on spontaneously infected wild plants of *R. roezli* and *R. nevadense* during three seasons indicated that *R. roezli* produced considerably more telia than in early tests in British Columbia because fewer infected leaves dropped before the telia were developed. Infected leaf surface and viable telia reached a maximum for both species in August, but declined more rapidly through September on *R. roezli* than on *R. nevadense*. Although *R. roezli* was the more susceptible and produced more telia,

it proved less dangerous per unit of population as a pine-infecting source because of the premature dropping of infected leaves. Severity of infection, site conditions, character of infected leaves, and occurrence of autumnal frosts were the more significant influences in the premature fall of infected leaves from *R. rooch*. Plants in the shade—especially on moist sites—held their leaves better than exposed plants and were a greater potential menace to pines than plants in the open. The time of year at which rains are of sufficient duration to permit pine infection will determine the establishment of rust on 5-needed pines from either *Ribes* species in any given year.

**Bleeding canker disease of California trees**, P. A. MILLER. (Univ. Calif.). (8. West. Shade Tree Conf., San Jose, Calif., 1941, Proc. Ann. Mtg., pp. 39-45).—In California, the disease was first observed in 1938 on *Quercus agrifolia*; since then it has been found in or reported from both the eastern and western coastal sections of the United States. The symptoms are described and successful inoculations with *Phytophthora* mycelium from cultures reported.

**The bleeding canker disease of hardwoods and possibilities of control**, F. L. HOWARD. (R. I. Expt. Sta.). (8. West. Shade Tree Conf., San Jose, Calif., 1941, Proc. Ann. Mtg., pp. 46-55, illus. 3).—Bleeding canker has been found infecting several genera of hardwood trees in various parts of the United States, the symptoms in general being similar in susceptible trees. A simple injection technic which avoids the entrance of air into the severed conducting tissues makes possible the infiltration of vascular elements with aqueous solutions of certain organic chemicals without appreciable injury to the cambium. A form of di-hydrochloride salt of di-amino-azo-benzene combined with a suitable penetrant and solvent antidotes the toxic substances formed by the causal fungus *Phytophthora cactorum* and inhibits its growth. Evidence of recovery is reported for over 85 percent of the 350 treated maple and beech trees.

**The effects of acids on a soil nematode**, W. STEPHENSON (*Parasitology*, 36 (1945), No. 3-4, pp. 158-164, illus. 3).—The general effects of immersing *Rhabditis terrestris* in acid media included an increased stickiness of the cuticle in certain solutions and the development of lateral bulges in the cuticle at the anterior region of the body—not necessarily in the same solutions. Movement gradually decreased and death eventually ensued—often followed by swelling. Preliminary tests indicated that the logarithm of the survival time was approximately proportional to that of the normality of the acid. Later results showed great variability, and it became necessary to restrict the work to a single normality of each acid. The toxicities of 0.206 N solutions of the 16 acids (hydrochloric, nitric, sulfuric, formic, acetic, propionic, butyric, isovaleric, glycollic, lactic, oxalic, malonic, succinic, malic, tartaric, and citric) were measured, the results indicating that the mineral acids had markedly greater effects than the organic acids, and the importance of the former was further illustrated by using mixtures of HCl containing varying amounts of organic acids. The differences among the mineral acids may be explained by the lyotropic effects of their anions. When equal normalities of organic acids were made up in a solution of HCl sufficiently strong to render the organic acids almost entirely undissociated, the relative toxicities of the mixtures were essentially the same as those of the dissociated acids. The differences among the acids are thus partly due to the pH differences and partly to the dissimilar effects of the undissociated acids. The latter are believed to be due to a variety of causes, including molecular size, polarity of the molecule, and other factors as yet undecided.

**A biological method of detecting the presence of fungicides on seeds**, H. W. MEAD (*Sci. Agr.*, 25 (1945), No. 7, pp. 458-460, illus. 1).—The basis of the test described and illustrated is the inhibition of growth of certain fungi on agar in the immediate vicinity of treated seeds. In exploratory tests with Ceresan very small

amounts were detected. The positive nature and sensitivity of the test make it reliable for determining the presence of fungicides and the coverage on a seed sample. With certain modifications, the method could possibly be used in evaluating fungicides as a preliminary to extensive field tests.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**A winter study of mule deer in Nevada,** C. M. Aldous (*Jour. Wildlife Mangt.*, 9 (1945), No. 2, pp. 145-151).—Several regulatory practices have had a cumulative effect in the sporadic and rapid build-up of mule deer over much of the western United States. Sample studies have been made in a part of the Nevada National Forest where the amount of winter range is the limiting factor. This was one of the few areas occupied by mule deer in which damage to the range was discovered in time to take remedial measures before the critical stage had been reached; it thus became possible to bring about a proper relation between the number of deer and the proper carrying capacity of the range. In this area, instead of 1 acre of winter range per deer month, there was but two-thirds of an acre available—an amount inadequate for the deer. The local annual census should be made immediately after the snow has disappeared from the flats on the winter range and the first green grass has appeared. Sex ratio counts should be made before any bucks have shed their antlers and should be based on at least 500 animals. Measurements of twig lengths to determine utilization of browse species before the deer enter the winter range are made and again just after the animals leave for the summer range. Chemical analyses of twig ends of browse plants showed the most nutrients to be in the leaves and bud ends. On ranges not overutilized, the deer select the tips or tender portions of stems; on overgrazed areas they consume practically all the current growth and sometimes much of the previous year's. Management practices should be based on the deer population in relation to acreage of winter range, the winter and spring condition of the animals, the winter sex ratio, and the degree of browse utilization.

**Non-breeding in bighorn sheep,** A. VAN S. PULLING (*Jour. Wildlife Mangt.*, 9 (1945), No. 2, pp. 155-156).—Observations by the author presented in this note lead him to believe that the reason back of the fact that the majority of the mature ewes failed to produce lambs is that there may have been temporary sterility on the Desert Sheep Range of southern Nevada as a result of their being overbred by too many rams. Though no actual proof for the theory is offered, the author is convinced that periodical nonlambing is the reason why local bighorns do not reach a saturated population.

**Habits, foods, and parasites of the bobcat in Minnesota,** C. T. ROLLINGS (Minn. Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 9 (1945), No. 2, pp. 131-145, illus. 7).—Minnesota bobcats were found to exhibit considerable pelage change with season and age; large individuals are often confused with Canada lynx. In recent years, the northern limit of range has extended from 100 to 200 miles to include southern Ontario. Spruce-cedar swamps are the preferred winter habitat. Winter range is no more than 10 to 15 miles square; an average of 5.5 miles was traveled in a night's hunting. Food is obtained largely by scavenging and by hunting small animals; birds are seldom sought. Stalking is a favorite method and elevated "lookouts" along game trails are often used; deer are seldom attacked. Bobcats are stealthy and shy, but will often follow human trails to investigate any scraps thrown aside; they spend the daylight mainly in temporary "rest-shelters." Varying hare, deer, and porcupine comprised over 90 percent of the foods recovered from 50 specimens; the deer material was largely or all carrion. No evidence of poultry or domestic stock was found in the stomach contents. The damage to deer and ruffed grouse in the State is negligible. From the gastrointestinal tracts of 50

bobcats 13 different helminth parasites were recovered, 5 apparently not reported previously from this host. Because the bobcat assists in controlling the varying hare, porcupine, and certain small mammals, it must be considered beneficial. A State bobcat bounty would ultimately be harmful to the interests of farmers, sportsmen, and others concerned with wildlife conservation.

The calcium requirement of growing foxes, L. E. HARRIS, C. F. BASSETT, S. E. SMITH, and E. D. YEMAN. (*Cornell Vet.*, 35 (1945), No. 1, pp. 9-22, illus. 6).—The diets used for the 6 lots of 18 silver foxes used in the study contained—on the dry basis—0.52 percent P, 1.29 percent cod-liver oil (containing 400 chick units of vitamin D per gram), and 0.16, 0.20, 0.30, 0.41, 0.51, and 0.51 percent of Ca, respectively. The first lots were housed in enclosed furring sheds; the sixth was exposed to sunlight. On the low Ca diets severe Ca-deficiency symptoms developed and are described. All animals on the 0.51-percent Ca diet continued normal. Food consumption and live weight gains were positively correlated with the amounts of Ca fed. Though analyses of the humeri for ash, Ca, and specific gravity at pelting time indicated the bones of foxes on the 0.41-percent Ca diet to be as good as those on the 0.51 diet, 67 percent of these animals exhibited marked Ca deficiency during the period of most rapid growth and 35 percent had crooked legs at pelting time; it thus appears that at least 0.51 percent Ca in the dry diet is required for normal bone growth. A Ca deficiency indirectly causes small pelts through lack of body growth and some rubbing of the pelt by the crippled animals. Lot 5 (housed in the furring shed) was superior to lot 6 (outside breeding pens) in the length and clearness of the silver band and clarity of the guard hair, but this lot had more pelts damaged from chewing.

Den-hunting foxes, W. S. HERT and G. J. LEVERSEE (*Genesee Co. [N. Y.] Farm and Home Bur. News*, 28 (1945), No. 4, pp. 1, 8-9, illus. 2).—Red and gray foxes frequently resort to a diet of poultry and other small livestock, as well as game birds, in the spring months; to prevent such destruction, organized den hunting is suggested and pertinent information is presented.

Field rodent control by destruction of burrows, T. I. STORER. (Univ. Calif.). (*Jour. Wildlife Manag.*, 9 (1945), No. 2, pp. 156-157).—Since reoccupancy of burrows is common among small rodents over long periods of time, it should become possible to increase the effectiveness of control measures against these pests by partial or complete destruction of the established burrows to which they resort.

Check-list of the birds of Nebraska, F. W. HAECKER, R. A. MOSER, and J. B. SWENK. (Univ. Nebr.). (*Nebr. Bird Rev.*, 13 (1945), No. 1, pp. 1-40).—An annotated list.

A check-list of West Virginia birds, M. G. BROOKS (*West Virginia Sta. Bul.* 316 (1944), pp. 56+, illus. 1).—A copiously annotated list.

Summer birds of the Fremont National Forest, Oregon, T. H. McALISTER, JR., and D. B. MARSHALL (*Auk*, 62 (1945), No. 2, pp. 177-189, illus. 1).—A copiously annotated list.

The history of bird banding, H. B. WOOD (*Auk*, 62 (1945), No. 2, pp. 256-265).—A review, with 36 references.

Live trapping of hawks and owls, R. E. STEWART, J. B. COPE, and C. S. ROBBINS (*Jour. Wildlife Manag.*, 9 (1945), No. 2, pp. 99-104, illus. 5).—Hawks of 6 species (80 individuals) and owls of 5 species (37 individuals) were trapped for banding—November 1, 1943, to May 26, 1944. In general, the pole traps proved better than hand-operated or automatic traps using live baits. Verbaile pole traps were very efficient and were more humane than padded steel traps because they rarely injured a captured bird. Unbaited Verbaile traps took a variety of captors, in rough proportion to their relative abundance, although slightly more of beneficial than of harmful types. Hawks and owls were retrapped more readily in these

traps than in other types tried; the number of song birds caught therein was negligible. Crows and vultures were not taken in Verbaal traps, but possibly could be caught with bait.

**Relations of the American coot with other waterfowl**, C. A. SOOTER (*Jour. Wildlife Manag.*, 9 (1945), No. 2, pp. 96-99).—The numbers and proportions of the American coot gave rise to the question of coot-duck relationships; the observations here recorded permit the inference that coot pugnaciousness reduces, to an unknown extent, the number of nesting sites available to other species. When the coot population is large, competition for nesting sites may be an important limiting factor, particularly with the ruddy duck; furthermore, the coots, by protecting their own brooding areas, influence the attractiveness of such places as feeding grounds for ducks. On areas where observations indicate that coots may be limiting the production of other birds, it would seem wise to initiate more extensive studies to determine the exact relationships; any efforts at their control, however, should be delayed until the results of such studies are available.

**The homing ability of the carrier pigeon—its value in warfare**, J. A. C. NICOL (*Auk*, 62 (1945), No. 2, pp. 286-298, illus. 2).—“Carrier pigeons can be trained to fly to lost sites which are frequently changed at intervals of 3 to 7 days. They can be trained to fly short distances at night. By placing the loft at one point and feeding the birds at another, carrier pigeons can be made to fly over both directions of a route. The pigeon utilizes visual aids in its flight and all training emphasizes this factor. Homing flights of pigeons may be compared to those migratory flights of wild birds which are proceeding to destinations previously visited over routes traversed on one or more earlier occasions. In long-distance races, pigeons are released at considerable distances beyond the point of their last training toss and are consequently compelled to home over territory new to their experience. ‘Inherited memory’ can play no part in such flights since the route, selected arbitrarily, bears no relation to the flight habits of its wild ancestry.”

**The ecology of the prairie chicken in Missouri**, C. W. SCHWARTZ (*Missouri Univ. Studies*, 20 (1945), No. 1, pp. 99-1, illus. 52).—This monographic investigation was conducted as part of the Federal Aid-Wildlife Program of the Missouri Conservation Commission, which has as its objective to develop a long-term comprehensive State-wide plan for managing each major native game and fur-bearing species and for every region of the State.

The sex ratio in *Tympanuchus cupido americanus* as revealed on the booming grounds and by counting birds in winter flocks are compared. The species formerly existed in every prairie county of the State and even on some Ozark ridges, but now it occupies only about 2,500 sq. miles in the northeastern, north-central, and southwestern parts of the State. The present distribution appears to be associated with land-use pattern, which is primarily determined by fertility, topography, and other land characteristics; medium fertility and large acreages of permanent pasture are characteristics of the most densely populated ranges. Prairie chickens are absent from 86 percent of the soils considered to be potential range.

Most booming grounds are on ridge tops or hillsides in fields of wild or tame hay, though some occupy level terrain and cropland; their locations are relatively permanent. The detailed findings, on fall and spring booming seasons, nesting and roosting, food habits, flocking, mortality factors, and management are presented and discussed. Most of the nesting begins late in April, the majority of the eggs hatching during the last week of May or first week of June. The diet consists almost entirely of plant matter during September-April; animal matter comprises up to 40 percent of the food eaten during the rest of the year. There is no evidence of migration at present, though formerly there were migratory flights. The principal mortality factors in the State are illegal hunting and land-use practices. Recom-

mended State-wide management practices include continuation of the annual spring booming-ground census and of legal protection, and improvement of the habitat by control of overgrazing, late mowing, burning, and provision for permanent water supplies. Management practices recommended under some very special conditions are restocking, control of damage caused to domestic crops, and establishment of management areas. Management practices at present not recommended are control of parasites or predators, opening of the hunting season, and special provision for winter food.

**Quadrat inventory of pheasant trends in Oregon.** A. S. EINARSEN. (Oreg. Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 9 (1945), No. 2, pp. 121-131, illus. 1).—Methods of determining trends in pheasant populations were sought to aid in improving game bird management in Oregon. The quadrat inventory proved practical, economical, and simple and can be used by laymen as well as game managers. The detailed technics and results of the study are presented.

**Age determination in the ring-necked pheasant.** J. P. LINDUSKA. (U. S. D. A.). (*Jour. Wildlife Mangt.*, 9 (1945), No. 2, pp. 152-154).—These studies on a comparatively large number of individuals showed that probing the bursa from without is a practical and reliable method for distinguishing adult birds from the young of the year—in either living or dead individuals—until as late as December. The "strength of lower mandible test" is an objective method of high accuracy useful in conjunction with spur examination to determine the age of practically all autumn cocks, and this combination—because of simplicity and speed—will probably be most useful in age analyses of shot birds on controlled hunting areas and in other situations where rapid determination is necessary. Plumage differences between adults and young cock pheasants also provide means for distinguishing a few autumn individuals, but too few of the young retain sufficient juvenile plumage into that season for this character to be of consequence when used alone.

**Inbreeding among pen-reared quail.** R. B. NESTLER and A. L. NELSON (*Auk*, 62 (1945), No. 2, pp. 217-222).—The experimental results reported "indicate that close breeding of quail can have deleterious effects on reproduction . . . . The one condition in the wild under which inbreeding might play a deciding role is when a species has been decimated to such few members that inbreeding is the only hope of survival."

**Picking among pen-reared bobwhite quail.** R. B. NESTLER, D. R. COBURN, and H. W. TITUS. (U. S. D. A. et al.). (*Jour. Wildlife Mangt.*, 9 (1945), No. 2, pp. 105-115).—During 1939-43 picking occurred in pen-reared birds at the Patuxent Research Refuge on all grains tested, the lowest incidence occurring with buckwheat as the sole grain in a growing diet. Picking occurred on 1 to 11 percent levels of fiber in a growing diet; it occurred on various grinds of corn, barley, and oats, but was least on that ground in a hammer mill with  $\frac{3}{16}$ -in. mesh screen. The incidence was as high on diets containing animal protein as on those with none. After picking began, addition of from 1 to 2 percent of salt to the diet for several days proved effective in many instances for checking the disorder; as a preventive, however, salt was of little value. Supplementing the regular diet with certain feed concentrates such as fish meal, soybean oil meal, liver meal, or chopped greens offered in a separate feeder for 1 to 2 days was as effective as added salt. More picking occurred among quail chicks on a 22 percent than on higher levels of protein. There was less picking on diets relished by the birds than on those seemingly unpalatable. There was no correlation with the amount of floor space per chick. Increase of the feeding and drinking space appeared to have a marked beneficial effect. Some adults on wire floors resorted to self-picking of their feet after their toes had been frostbitten.

**Value of wild feedstuffs for pen-reared bobwhite quail in winter,** R. B. NESTLER, W. W. BAILEY, A. C. MARTIN, and H. E. MCCLURE. (U. S. D. A. et al.). (*Jour. Wildlife Manag.*, 9 (1945), No. 2, pp. 115-120).—During two winters' experiments (1939-41) involving 456 birds at Bowie, Md., on the feeding value and palatability of 20 common wild quail foods as part-time maintenance diets, mortality was low on all diets, the highest occurring on that containing a mixture of bayberry and wax myrtle fruits. On all diets the birds gained in weight during early winter, these gains being better maintained by those on wild foods than by the ones on control diets composed of cultivated feedstuffs. There were statistically significant differences among the amounts of the various diets eaten; for palatability and acceptability, seeds of common ragweed and of shrub lespedeza were the preferred wild foods. It is concluded that pen-reared bobwhite quail can be maintained successfully in the vicinity of Washington, D. C., on diets containing 50 percent of any one of the wild foods listed and 50 percent of a high-caloric commercial seed mixture with yellow corn as the principal cereal. These results do not necessarily represent selections that might be made by bobwhites in the wild.

**Life history of the eastern pickerel in Babcock Pond, Connecticut,** L. E. FOOTE and B. P. BLAKE. (Univ. Conn.). (*Jour. Wildlife Manag.*, 9 (1945), No. 2, pp. 89-96).

**New spiders from the Great Smoky Mountain National Park,** W. M. BARROWS. (Ohio State Univ.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 1, pp. 70-76, illus. 11).—Three new species are described.

**New developments in insecticides,** L. D. GOODHUE. (U. S. D. A.). (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 3, pp. 255-262).—Concerns DDT repellents, synergists for insecticides, better pyrethrum extracts, fumigants, and insecticidal aerosols. There are 33 references.

**New British insecticide** (*Soap and Sanit. Chem.*, 21 (1945), No. 5, p. 103).—Note on a new British organic insecticide, Gammexane or 666 (benzene hexachloride), claimed to be particularly effective against the African migratory locust, house cricket, body louse, and bedbug, as well as against various leaf-eating larvae, weevils, ants, wasps, etc.

**Insecticidal sprays and flying insects,** W. A. L. DAVID (*Nature [London]*, 155 (1945), No. 3929, p. 204, illus. 3).—A preliminary note on the coverage and effects of insecticidal sprays on motionless v. flying insects.

**The setting point of DDT,** E. E. FLECK and R. K. PRESTON. (U. S. D. A.). (*Soap and Sanit. Chem.*, 21 (1945), No. 5, pp. 111, 113, illus. 1).—"The setting-point curve for mixtures of 2,2-bis(*p*-chlorophenyl)-1,1,1-trichloroethane and 2-*p*-chlorophenyl-2-*o*-chlorophenyl-1,1,1-trichloroethane has been determined. The content of 2,2-bis(*p*-chlorophenyl)-1,1,1-trichloroethane in technical DDT, as indicated by the setting point, has been compared with that obtained by recrystallization of the technical DDT from alcohol."

**DDT on the farm,** C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 4, pp. 1, 2).—A practical account.

**Insecticidal activity of some alkoxy analogs of DDT,** E. A. PRILL, A. HARTZELL, and J. M. ARTHUR (*Science*, 101 (1945), No. 2627, pp. 464-465).—Several 2,2-bis(*p*-alkoxyphenyl)-1,1,1-trichloroethanes were synthesized and tested on houseflies in comparison with DDT, 2,2-bis(*p*-chlorophenyl)-1,1,1-trichloroethane (m. p. 107°). The methoxy analog showed a surprisingly good knock-down and at 0.4 gm. per 100 cc. gave a good kill. The ethoxy analog at a concentration of 0.2 gm. per 100 cc. gave a good kill and a knock-down distinctly better than that given by DDT, although not as good as that given by the methoxy analog. The *n*-propano analog (m. p. 62°) showed a low order of toxicity toward houseflies and the *n*-butoxy analog (m. p. 50°) practically none. DDT and the methoxy and ethoxy analogs were found about equally effective against the southern house mosquito

larvae. The results of preliminary feeding tests suggest that the ethoxy analog may be less toxic than DDT to higher animals.

**Acaricidal property of a new insecticide, hexachlorobenzene.** E. L. TAYLOR (*Nature [London]*, 155 (1945), No. 3935, pp. 393-394).—Tests are noted with a new insecticidal product designated "666" (hexachlorobenzene), found by the author "to be at least as effective as DDT" against lice on guinea pigs, exceedingly toxic to certain fresh water crustaceans, and to give promise of being one of the most potent acaricides as indicated by trials on rats with notoedric mange.

**Benzenehexachloride: A promising new acaricide.** E. L. TAYLOR (*Vet. Rec.*, 57 (1945), No. 18, pp. 210-211).—The author notes in this article that benzenehexachloride ("666"), has proved very effective as an acaricide in rats infected with *Notoedres muris* when used as a 1 percent solution in liquid paraffin. On the unwashed skin it was found to be superior to either benzyl benzoate ("Ascabiol") or tetraethylthiuram-mono-sulfide ("Tetmosol"). DDT, when used in the same way, proved comparatively ineffective. No evidence of skin irritation was observed with "666."

**An insect-catching grass.** C. B. WILLIAMS (*Entomologist*, 78 (1945), No. 982, pp. 37-38).—Note on a sand-burr grass, *Cenchrus myosuroides*, found in Ecuador catching large numbers of small insects by its sticky spined heads.

[Papers on insect pests] (*N. Y. State Hort. Soc. Proc.*, 90 (1945), pp. 30-53, 190-213).—The following are included: New Developments in Materials and Machinery for Fruit Insect Control, by C. E. Palm (pp. 30-33), and Experiences With Insect Control in 1944 (pp. 33-38) and Fruit Insect Problems [in New York] in 1944 (pp. 38-46), both by J. E. Dewey (all Cornell Univ.); Codling Moth Control With Dusts and Sprays, by S. W. Harman (pp. 46-53) (N. Y. State Expt. Sta.); Codling Moth Control Developments in Virginia, by W. S. Hough (pp. 190-194) (Va. Sta.); Experiences With Additives to Lead Arsenate in Codling Moth Control, by H. M. Steiner (pp. 195-207) (Pa. Sta.); Some Reasons for the Severe Increase in Codling Moth Injury in Eastern New York in 1944, by D. W. Hamilton (pp. 207-210) (U. S. D. A. coop. N. Y. State Sta.); and The Use of Dusts for Codling Moth Control, by J. L. Brann, Jr. (pp. 210-213) (N. Y. State Sta. coop. U. S. D. A.).

**Farm animal insects and their control.** A. V. MITCHENER (*Manitoba Dept. Agr. and Immigr. Pub.* 196 (1945), pp. [12]).—A leaflet-folder giving tabulated information on the insects and on their injuries and control.

**Conditions governing the distribution of insects in the free atmosphere, [I], II.** W. G. WELLINGTON (*Canad. Ent.*, 77 (1945), Nos. 1, pp. 7-15, illus. 1; 2, pp. 21-28, illus. 1).—The first of this series of papers deals with laboratory experiments to determine the effects of substantial decreases in air pressure, temperature, and humidity on certain common insects; test environments were established, and all single or combined limiting, sterilizing, or lethal factors were sought. It is evident from the findings that decreases in atmospheric pressure may safely be neglected as either limiting or lethal factors at the higher altitudes. Temperature is the definite limiting factor to any attempt by an insect to reach higher altitudes by its own efforts, since it is obvious that no insect could continue to support itself by flight if it were cooled below this particular minimum flight temperature. Regardless of the specific differences in that temperature, it may be taken for granted that no active flight would extend above the height of the zero isotherm. Insects with relatively hard exoskeletons may easily withstand several freezings under saturated conditions in convective circulation; soft-bodied insects—e. g., *Chrysopa* sp.—are instantly rendered vulnerable to the cold by saturated air or by deposited surface moisture. It was found that a number of nocturnal insects have lower minimum flight temperatures than those of diurnal habits. It was noted that any insect cooled below its minimum flight temperature invariably folded its wings in

the normal rest position. Changes in relative humidity ordinarily seemed to have slight effect on the average insect under flight conditions, except in saturated air at freezing temperatures. Some evidence of sex differences in resistance—particularly to temperature—was found. With field-collected adults, it is of interest to note that a ♀ of *Calliphora vomitoria* deposited ova after exposure to all the test conditions, and that a ♀ of *Diucrisia virginica* deposited eggs after exposure to all these conditions and then stored at freezing temperatures for another 24 hr. It is evident that the great changes experienced by insects distributed actively or passively through the upper air have in most cases no apparent lethal or sterilizing effects.

In part 2, Surface and Upper Winds, the horizontal distributive powers of the wind in the lower layers are neglected, since they are so well-known. The chief concern is a consideration of the lower winds as a means of carrying insects to higher altitudes, and the efficiency of the stronger upper winds as agents of insect transport vertically and horizontally through the so-called "plankton" zone (above 60 m.). As a result of this experimental study the author believes that ascending currents are necessary to produce or maintain the plankton population of the atmosphere at air temperatures below about 7° C. or—during the summer air conditions of temperate North America—at corresponding altitudes above 2-25 km. Accordingly he suggests that some distinction be made between the levels of the insect plankton zone, as determined by the effect of air temperature on the relative ability of insects to remain active, and hence air-borne. For instance, the lower levels of the zone—at temperatures above 7°—might be termed the "active" plankton zone; this would include the vast majority of the aerial insect population and would embrace all individuals liable to extensive horizontal distribution by winds. Winged forms would be capable of maintaining a flight attitude in this temperature zone, and could be borne great distances. Wingless forms in this zone would still depend on the presence of turbulence for maintenance of altitude, and hence for any lengthy horizontal transport by the wind. The upper levels—at temperatures below 7°—might be termed the "inert" plankton zone. The majority of insects within this region would depend solely on vertical rather than horizontal air current and—except for spiderlings—would not be liable to any extensive horizontal distribution, regardless of wind velocity. Since both strong winds (with attendant turbulence) and convection are normally diurnal phenomena, the greatest population density in the atmosphere would normally occur during daylight hours.

The areas of origin of locust flights in the different parts of India with reference to the question of their control, Y. RAMCHANDRA RAO (*Cur. Sci. [India]*, 14 (1945), No. 2, pp. 31-33, illus. 3).

New genera and species of North American Tachinidae (Diptera). H. J. KLEINHARD. (*Tex. Expt. Sta.*). (*Canad. Ent.*, 77 (1945), No. 2, pp. 28-36).—Five new genera and 11 new species of tachinid flies are described.

Notes on the synonymy, nymphs, and distribution of *Heteropsylla texana* Crawford (Homoptera: Psyllidae), D. D. JENSEN. (*Hawaii Expt. Sta.*). (*Pan-Pacific Ent.*, 21 (1945), No. 2, pp. 74-76).

Minnesota Phalaenidae (Noctuidae): The seasonal history and economic importance of the more common and destructive species, H. KNUTSON (*Minnesota Sta. Tech. Bul.* 165 (1944), pp. 128, illus. 22)—The moths belonging to this family are among the most destructive insects to Minnesota crops. In this publication the author has summarized their economic importance, previous work on the group in Minnesota, and their general life history, ecology, and distribution. Information is included on 395 species which are known to occur in Minnesota. Light trap collections were made over a period of several years, and numerous museum specimens were examined as well as field collections and rearings. Damage, sea-

sonal history, economic importance, and distribution of the various species are discussed where such data are available. The number of generations per year for 232 species was established by this work. Of this number, 175 proved to be one-generation species, while 57 were multiple-generation species.

In light trap studies males, in general, outnumbered females by about three to one. In one instance with *Nephelodes emmedonia* (Cram.), 156 males to 1 female were found, whereas with *Archanaea subflava* (Grt.) 16.2 females to 1 male were noted. In the case of 4 species, *Feltia ducens* Wlk., *Lacinipolia renigera* (Steph.), *Protolucania albilinea* (Hbn.), and *Crymodes devastator* (Brace), light trap were studied with special reference to the reliability for determining seasonal history, and with minor exceptions these light trap collections were found to be representative of the actual conditions as shown by ovariole dissections and hand collections. The author believes that in almost all species the light trap catches approximated the true seasonal history but points out the few exceptions to this case. Light traps operated under many conditions over a long period of time proved exceedingly useful in this study.

Data on less common and less destructive studies are included in tabular form. Thirty-nine references to the literature are cited, and graphic representations of the flights of 54 of the common species as determined by light trap catches are shown in illustrations. A host plant index and an index of scientific and common names are also given.

The genus *Phyciodes* (Lepidoptera: Nymphalinae), W. T. M. FORBES. (Cornell Univ.). (*Ent. Amer.*, 24 (1944), No. 4, pp. 139-207, illus. 85).—The author presents this paper as a running commentary on A. Hall's revision of the genus, issued as a supplement to the Bulletin of the Hill Museum (Witley, England). The genus is considered in its broad sense, including *Eresia*. Tables and synopses of the groups are presented, and keys for identification are provided.

Some effects of antisera on larvae of the southern armyworm' (*Prodenia eridania* (Cram.)), J. F. YEAGER and R. C. HEISHMAN. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 1, pp. 45-52).—Antisera against the body fluid (hemolymph) and other tissues of the southern armyworm were prepared by injecting extracts thereof from sixth instars into rabbits. Precipitin and agglutinin tests indicated that the titers of the antisera were not high, probably because of certain factors discussed. Injection into larvae of the antisera against their hemolymph caused rapid agglutination and decrease in number of circulating hemocytes, some degree of passive-active transformation, and probably some precipitation of plasma proteins. The cellular changes were reversible and most marked up to about 6 hr. after injection; the hemolymph regained its normal appearance within about 2 days. Reversible hematological changes of similar nature—but much less marked—were caused by injection into larvae of rabbit antisera against insect gut wall and gut contents. No gross changes in the appearance of the other insect tissues—observed histologically—followed injection of the antisera. Some evidence was obtained that injection into larvae of rabbit antiserum specific against larval hemolymph may cause increased mortality in the insects. Feeding antisera or mixtures thereof to larvae caused no mortality. Hemolymph from either normal or heat-fixed sixth instars can be used in producing antisera effective against the normal hemolymph of fifth or sixth instars.

An occurrence of polyhedral disease in *Chimabache fagella* F. (Lep.: Oecophoridae), J. W. HESLOP HARRISON (*Ent. Mo. Mag.*, 4. ser., 6 (1945), No. 64, p. 77).—A note.

The distribution and abundance of the Japanese beetle from 1935 through 1943, with a discussion of some of the known factors that influence its behavior, I. M. HAWLEY and T. N. DOBBINS. (U. S. D. A.). (*Jour. N. Y. Ent.*

*Soc.*, 53 (1945), No. 1, pp. 1-20, illus. 7)—The discussion includes changes in the generally infested area and factors influencing the rate of spread, the beetle abundance in the area of general distribution and biotic factors causing changes in numbers, and the status of the beetle in the isolated colonies of the outer zone.

The odoriferous glands in the Tenebrionidae, L. M. ROTH. (Ohio State Univ.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 1, pp. 77-87, illus. 20).—A number of species of these beetles are shown to possess odoriferous or repugnatorial glands. A study of the yellow and dark mealworms *Gnathocerus cornutus*, *Diaperis maculata*, and *Palorus* sp. by the KI starch and concentrated H<sub>2</sub>SO<sub>4</sub> tests showed them all to give off an odoriferous substance. Within this group there seems to be an evolution not only of the unicellular gland but also of the manner in which the odoriferous fluid is stored and distributed; this paper deals primarily with the structure of these "stink" glands.

Life history of the wireworm, *Conoderus bellus* (Say), H. H. JEWETT (*Kentucky Sta. Bul.* 472 (1945), pp. 8, illus. 5).—This wireworm has been found to injure corn, lespedeza, and tobacco when these crops follow bluegrass sod in a rotation. Adults which overwinter begin laying eggs about May 1 and continue to mid-July or later. These eggs hatch into adults which appear the same season but do not lay eggs until the following spring and summer. Larvae are small, and unless numerous do little damage except to seedling plants and germinating seed. It is suggested that since the beetles begin laying about May 1, the land be broken early to discourage oviposition.

Wireworms and food production, H. W. MILLS (*Nature [London]*, 155 (1945), No. 3927, pp. 136-138).—A general discussion of wireworms in Great Britain, the promising results of the more recent investigations on their control, and the outlook for the future in relation to the establishment of a flexible agriculture and removal of fears of the farmer that the benefits from resting the land under grass would be dissipated by the depredations of the wireworms.

Literature of the black carpenter ant, *Camponotus herculeanus pennsylvanicus* (Degeer.): A bibliography with abstracts, L. H. TOWNSEND (*Kentucky Sta. Ctr.* 59 (1945), pp. 27).—About 130 abstracts are given.

The carnivorous habits of the adult wasp, *Odynerus dorsalis* Fab., P. RAU (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 1, pp. 29-30).—This ordinarily nectar-feeding wasp was observed to malaxate a caterpillar of *Pholisora catullus*.

Rainfall in relation to scarcity or abundance of wasps (Hym.: Vespidae), H. SCOTT (*Int. Mo. Mag.*, 4 ser., 6 (1945), No. 65, pp. 97-98).—Thus "note is written on the assumption that—if other possible factors be left out of account—high rainfall in the late spring and early summer conduces to great scarcity of wasps, later in the season."

A wasp preying on house-flies and stable-flies, E. M. CALLAN (*Nature [London]*, 155 (1945), No. 3927, p. 146).—The large neotropical wasp *Rubrica surinamensis* (DeGe.) is reported as preying upon the housefly and stablefly in Trinidad, a matter of some interest in view of the fact that these pests have few natural enemies.

A new species of *Pseudomethoca* (Mutilidae) from the West Indies, R. M. SCHUSTER. (Cornell Univ.). (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 1, pp. 7-8).—Description of *P. olgae* n. sp., with key to the species of the genus.

Three new species of *Mutillidae* from Peru and Bolivia (Hymenoptera), C. E. MICKEI. (Minn. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 1, pp. 38-44).—New species of the "velvet ants," viz., *Hoplocrates* (1) and *Traumatomutilla* (2), are described.

Field crop insects in the Prairie Provinces (*Winnipeg: Line Elevators Farm Serv.*, 1945, pp. 64, illus. 41).—An informative manual, including two colored plates.

On competition between different species of graminivorous insects, A. C. CROMBIE (*Roy. Soc. [London], Proc., Ser. B*, 132 (1945), No. 869, pp. 362-395, illus. 8).—The growth of pure populations of the lesser grain borer, saw-toothed grain beetle, and angoumois grain moth was observed in a standard medium of wheat maintained at a constant level by periodic removal of "conditioned" frass and addition of fresh grains. The population of each species rose to a maximum and remained fluctuating about this value indefinitely. Comparison of the oviposition rates with rates at which adults emerged indicated that in the maximum population the mortality was always over 90 percent in the immature stages. When pairs of species competed, *Rhizopertha* eliminated *Sitotroga* because their larvae (where most of the competition occurred) have the same needs and habits. Each of these beetles was able to survive *Oryzaephilus*, however, because this species occupies a different "ecological niche." Statistical analyses by the Verhulst-Pearl "logistic" equation and the Lotka-Volterra simultaneous equations showed the biological assumptions to be true for practical purposes for *Rhizopertha* and *Sitotroga*, viz., that the value of the potential rate of increase remains statistically constant and that all the factors inhibiting increase are linearly related to population density. Furthermore a single factor, larval competition, was represented by single indexes standing for interspecific inhibition. It follows that the maximum population (equilibrium position) should be independent of the initial population, which proved true for all three species. Details of these analyses are discussed.

Populations living in a medium of unrenewed wheat rose to a maximum and then declined as the food became exhausted and "conditioning" increased. The eventual extinction of the population was due to failure of the larvae to survive. The longevity of *Rhizopertha* adults was lower in unrenewed than in renewed media, but lower still when it was competing with *Sitotroga* in unrenewed medium; that of the other species, as well as the sex ratio of *Sitotroga*, was apparently unaffected by these conditions. The fecundity of *Rhizopertha* ♀♀ decreased with time, and the length of *Sitotroga* adults of both sexes decreased in succeeding generations. The competitive relationship between both *Sitotroga* and *Rhizopertha*, and *Oryzaephilus* shifted slightly in favor of the former species in unrenewed as compared with renewed media. In a renewed medium this relationship is believed to depend chiefly on the destruction of eggs and pupae by adults and larvae—for which the more predaceous *Oryzaephilus* is better placed. In an unrenewed medium the ability of the larvae to make the best use of the limited food supply is the determining factor, and here the two other species have the advantage. The competitive relationship between *Rhizopertha* and *Sitotroga* remained the same in both media. There are 87 references.

Experimental determination of the influence of the red-legged earth mite (*Halotydeus destructor*) on a subterranean clover pasture in Western Australia, D. R. NORRIS (*Austral. Council Sci. and Indus. Res. Bul.* 183 (1944), pp. 36, illus. 4).—In the 3-yr. period studied, mite damage caused considerable reduction in the foliage and seed yield of subterranean clover; the weight of individual seeds was also reduced by the attack. Secondary effects of the mite attack on clover was also demonstrated—particularly in the third season when the yield of Wimmera ryegrass was shown to be closely correlated with that of the subterranean clover. Where the clover yield was reduced by the mites, there was a correspondingly lower yield of the grass. The direct effect of the mite on this grass is believed to be unimportant, though indirect evidence is given to show that association with subterranean clover may produce a growth of ryegrass more susceptible to mite attack. This effect is believed to have been due to the reduced contribution to the soil fertility of the clover on infested plots. The yield of volunteer annual clovers in the third season showed a pronounced negative correlation

with that of subterranean clover. These species are comparatively insusceptible to mite attack, but showed indirect effects through association with subterranean clover.

Planning the fight against the European corn borer in the North Central States, W. WIDAKAS (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 4, pp. 29-31).—Recommendations of a conference held at Purdee University are presented.

When to begin dusting for control of cotton insects, A. L. HAMNER (*Miss. Farm Res.* [*Mississippi Sta.*], 8 (1945), No. 5, p. 2).—A practical account.

Cotton insect recommendations for 1945, C. LYLE (*Miss. Farm Res.* [*Mississippi Sta.*], 8 (1945), No. 5, pp. 7, 8).

Delta oat growers advised to watch for armyworms, C. LYLE (*Miss. Farm Res.* [*Mississippi Sta.*], 8 (1945), No. 4, p. 7).—A practical account.

Notes on the potato tuber moth *Gnorimoschema (Phthorimaea) operculella* (Zell.) in New Jersey, W. M. BOYD (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 1, p. 68).—The progressive death of larvae and prepupae observed and the disappearance of the potato tuber worm led to the assumption that winter survival was possible only in the pupal stage.

Effectiveness of DDT against potato insects, J. A. MUNRO and K. REDMAN (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 4, p. 11).—In this preliminary test conducted in 1944 by the station, yields of 174.4 bu. per acre were obtained with DDT 5 percent and copper-dusted potatoes as compared to 160.0 for arsenical only, 166.1 for copper-lime dust, 166.5 for DN dust copper, 169.7 for Dithane, and 173.4 for Sabadilla and copper.

A preliminary report on the climatology of the wheat stem sawfly (*Cephus cinctus* Nort.) on the Canadian prairies, H. L. SEAMANS (*Sci. Agr.*, 25 (1945), No. 7, pp. 432-457, illus. 18).—This sawfly is a native grass-inhabiting insect which has become a wheat pest of the Canadian prairies. The adults emerge in June and oviposit in well-developed stems of grasses and grains, and the larvae spend the summer feeding therein. As the plants mature the larvae girdle the stems from within, just above the soil surface; the stems fall over and the larvae then spend the winter in silken cocoons in the cut stubs. Pupation occurs late in May. Wet rainy weather in spring affects the pupation, and emergence of adults and a stormy June may kill some of them. Development of a few strong plants in spring results in a concentration of eggs therein; one larva matures in each stem after destroying all the other eggs and larvae. A fall precipitation which builds up reserve moisture in the soil and causes an even development of host plants reduces the egg concentration and insures a greater number of larvae per number of eggs laid. Heavy summer precipitation which produces a rank growth of the plant, results in the drowning of many larvae in the sap which runs into the hollow stem from their feeding cuts. Weather conditions during the crop year August 1-July 31 apparently affect the sawfly population for the next season. The two periods August-October and May-July seem to exert the greatest influence on both plant and sawfly, and the effects of weather appear to be more of a cumulative influence of each period rather than the effects of separate months. Hythergraphs were constructed on a 3-mo. cumulative basis and used in discussing weather conditions; they are used in correlating individual seasons and sawfly fluctuation, as well as the prairie climate and the sawfly distribution. There appears a possibility of forecasting sawfly fluctuations with greater accuracy when the present information can be correlated with soil moisture investigations. At present a tentative forecasting can be made on the basis of precipitation and mean temperature for the periods August-October and May-July.

Wheat stem sawfly and harvest loss, J. A. MUNRO (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 4, pp. 12-16, illus. 2).—A practical account including three tables showing a loss of grain in infested wheat fields averaging 1.80 bu. per acre com-

pared with noninfested fields where the average loss was only 0.26 bu. per acre, the maximum daily wind velocity at Jamestown and Minot, and the weight of wheat from infested and noninfested stems.

**Vegetable insects and their control**, A. V. MITCHENER (*Manitoba Dept. Agr. and Immigr. Pub.* 198 (1945), pp. [12]).—A leaflet-folder giving tabulated information on the insects and on their injuries and control.

Orientation experiments on larvae of *Pieris brassicae* L., C. L. COLLENETTE (*Entomologist*, 78 (1945), No. 982, pp. 33-36, illus. 1).—The results of studies of this cabbageworm here detailed indicate that in sunny weather the larvae clearly return to the food plant from which they were taken, if this happens to be the nearest or highest object in the vicinity. In dull or rainy weather they appeared to be lost, were usually unable to detect a higher object in the vicinity, and only recovered their home plant by chance. In dull weather they tended to become motionless or to move very slowly, and a proportion would still be in the vicinity when the light improved. Scent, sense of direction, and direction of the wind apparently did not influence the larvae. The tests also seem to show that they cannot see distinctly at a distance, or that they are unable to recognize their food plant by light. When the light was good enough (sun or light cloud), they made for the nearest object above their own level which loomed over them, up to a distance of 2 ft.

[**Insect pests of orchard fruits**] (*Pa. State Hort. Assoc. Proc.*, 85 (1944), pp. 74-89).—The following papers are included: Continued Fruit Insect Studies in Southern Pennsylvania, by H. M. Steiner (pp. 74-86) (*Pa. Expt. Sta.*); and The Codling Moth—Enemy Number One of the Apple, by J. O. Pepper (pp. 87-89) (*Pa. State Col.*).

**Five new species of Aleyrodidae from California (Homoptera)**, W. W. SAMPSON. (*Univ. Calif. Pan-Pacific Ent.*, 21 (1945), No. 2, pp. 58-62, illus. 5).—Descriptions of new species of white flies.

El efecto de algunos insecticidas en el establecimiento y desarrollo de las larvas migratorias de la conchuela roja de los citrus *Aonidiella aurantii* (Mask) [**The effect of some insecticides on the establishment and development of the migrating larvae of the California red scale**], G. ROSENBERG M. (*Bol. Sanid. Veg. [Chile]*, 3 (1943), No. 2, pp. 143-156, illus. 3).

**Summary of field experiments with DDT and rotenone used in red scale control**, W. EBELING. (*Calif. Citrus Expt. Sta.*). (*Citrus Leaves*, 25 (1945), No. 4, pp. 10, 18, 22, illus. 1).—A preliminary report briefly summarizing the results of field tests of DDT and of derris extractives and cube root, usually dissolved on various fractions of petroleum.

**Spraying for the sycamore scale**, R. H. SMITH. (*Univ. Calif. 8. West. Shade Tree Conf., San Jose, Calif., 1941, Proc. Ann. Mig.*, pp. 30-38, illus. 4).—This insect—*Stomacoccus platani*—is said to be an important pest of sycamore trees throughout California, *Platanus orientalis* being the favored host. The observations and results of experiments over a 1-yr. period are presented here. Spraying in January proved more effective than at other times during the year. The most conspicuous injury by this pest is in the deformation of developing leaves in spring and the formation of innumerable dead spots on the older leaves during spring and summer. Notes on the life history and seasonal history of the scale are presented.

**The restriction of insect infestation to the periphery of bulk wheat**, F. WILSON (*Jour. Council. Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 1, pp. 1-5).—Insect infestation of Australian bulk-wheat storages was found restricted to a narrow zone at the periphery of the wheat mound. This restriction developed gradually during the history of an infestation, and was due to the heat generated

by the insects, loss of moisture from the rise in temperature, and the consequent development of a combination of temperatures and moisture contents within the grain mound which proved lethal to the insects. The temperature of the interior lethal zone was maintained by insect activity in the peripheral zone, where higher wheat moisture contents permitted insect development at temperatures as high as or higher than those occurring in the lethal zone.

On the inheritance of food effects in a flour beetle, *Tribolium destructor*, J. M. REYNOLDS (*Roy. Soc. [London], Proc., Ser. B*, 132 (1945), No. 869, pp. 438-451, illus. 1).—Evidence is given that parental feeding affects the developmental rate and mortality of the offspring in this flour beetle; the relation of this to experiments on the inheritance of acquired food habits in insects is discussed. It is shown that no work on the developmental rate in *Tribolium* is likely to be wholly satisfactory unless the parental food is known. Some larvae developed slowly under the most favorable and others at nearly maximum rates under the most unfavorable conditions. Handling lengthened the developmental period and tended to increase variability; isolation increased the developmental rate. As to flour percentages, 85 was beneficial and 60 detrimental—both as parental and larval food—in the effects on developmental rate and mortality; 75 percent flour resembled the 85 in its effect on mortality but in its effect on larval development rate it resembled the 60 percent. No evidence was found that poor food conditions especially affect the later instars and metamorphosis. There are 43 references.

Controlling insects in flour mills, R. T. COTTON, J. C. FRANKENFELD, and G. A. DEAN. (*Coop. Kans. Expt. Sta.*) (*U. S. Dept. Agr. Cir.* 720 (1945), pp. 75+, illus. 41).—Various methods found useful in preventing insect infestation in flour during the process of manufacture and subsequent handling are discussed in this publication. Practical methods of insuring the production of insect-free flour include holding insect population in the flour mill at a low level by sanitation, periodic general mill fumigations, heat treatments, supplemental local fumigation of milling units, and finally treating the finished flour by centrifugal force or redressing it by means of a sifter. Mill and warehouse fumigation with hydrocyanic acid, methyl bromide, and chloropicrin is dealt with in detail.

This is a revision of Circular 390 (E. S. R., 76, p. 214).

[Brief papers on mosquitoes] (*Mosquito News*, 5 (1945), No. 1, pp. 1-18, illus. 13).—The following are included: Notes on *Anopheles occidentalis* D & K and *A. quadrimaculatus* Say, by R. Matheson (pp. 1-3) (Cornell Univ.); A Mechanical Trap for the Sampling of Aerial Insect Populations, by J. C. Chamberlin and F. R. Lawson (pp. 4-7), and Abundance and Flight Habits of Certain Alaskan Mosquitoes, as Determined by Means of a Rotary-Type Trap, by H. H. Stage and J. C. Chamberlin (pp. 8-16) (both U. S. D. A.); and A New Variety of the *Anopheles pseudopunctipennis* Complex in Ecuador (Diptera: Culicidae), by R. Levi-Castillo (pp. 17-18).

The biology and seasonal cycle of *Anopheles farauti* on Espiritu Santo, New Hebrides, R. H. DAGG (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 1, pp. 1-13).—This mosquito—the sole anopheline occurring in the New Hebrides group—has been more commonly known in these islands as *A. punctulatus moluccensis*; for the present the name *A. farauti* is being used for those specimens from the New Hebrides, Banks Islands, Solomons, Bismarck Archipelago, Admiralty Islands, and eastern New Guinea; with this distribution and its high efficiency as a malarial vector, it is of prime importance in the malarial problem of troops now in this region. This paper details previous observations in the New Hebrides and a year's observations by the author on the precipitation, geological structure and drainage, larval breeding places, seasonal changes in breeding sites, man-made malaria (referring to man-made breeding places), saline tolerance of the larvae, life cycle, habits of the adult, and relationship to filariasis—a probable vector.

Anofelinos de Mexico.—I, Clave para la determinacion de las especies y subespecies, basada en los caracteres de las hembras adultas [Anophelines of Mexico.—I, Key for determining the species and subspecies of *Anopheles*, based on the characters of the adult female mosquitoes], D. PELAEZ (*Ciencia [Mexico]*, 6 (1945), No. 2, pp. 69-77, illus. 25).

A new species of *Aedes* from the Caroline Islands (Diptera: Culicidae), D. S. FARNER (*Biol. Soc. Wash. Proc.*, 58 (1945), pp. 59-61).

The intermediary hosts of malaria in the Netherlands East Indies, F. H. TAYLOR (*Austral. Dept. Health, Serv. Pub. (School Pub. Health and Trop. Med.)* No. 5 (1944), 2. ed., pp. 100, illus. 41).—There are three anophelines in the Netherlands East Indies which are extremely efficient intermediary hosts of malaria wherever they are found, viz, *Anopheles maculatus* Theob., *A. minimus* Theob., and *A. sundicus* Rodenwaldt. Of the remainder, *A. barbirostris* v. d. Wulp and *A. bancrofti* Giles must not be overlooked as potentially important species. *A. barbirostris* has been proved to be important both in the Netherlands East Indies and in Malaya, being capable of originating epidemics of malaria, while *A. bancrofti* has been found to be heavily infected in nature. A key to the species is included in this compilation, as are also notes on the distribution of malaria, by R. E. Murray (pp. 93-100).

Derivatives of piperic acid and their toxicities toward houseflies, M. E. SYNERHOLM, A. HARTZELL, and J. M. ARTHUR (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 9, pp. 433-442).—An accelerated search for substitutes for pyrethrin has uncovered a number of substances with varying degrees of toxicity; these include a wide variety of esters and substituted amides of piperic acid which are toxic to houseflies. The most toxic amides found in this study were those derived from primary or secondary alkyl amines containing from 3 to 7 C atoms; in the ester series the most effective were those derived from alcohols with over 3 but less than 7 atoms. The amides and esters of piperic acid have a synergistic action when used with pyrethrins against houseflies. Esters prepared from phenols and amides from aromatic amines are relatively nontoxic. The methylenedioxy group—apparently important in ascribing toxicity to the piperic acid residue—does not enhance the activity when it appears also in the substituents. The presence of a thiocyano group in either an aliphatic or aryl piperate renders the compound less effective. The presence of halogens does not seem to improve the activity; in some cases—viz, the esters—their presence appears to impair it. Piperic acid itself is devoid of insecticidal activity. Descriptions, with analyses, are presented for 25 previously unreported amides of piperic acid and for 22 new piperic acid esters.

Histological effects of certain sprays and activators on the nerves and muscles of the housefly, A. HARTZELL (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 9, pp. 443-454, illus. 4).—The effects of eight fly sprays and activators were observed in histological preparations of adult houseflies sprayed under Peet-Grady test conditions. Flies were selected that would elicit some minor response on stimulation but were unable to fly, i.e., moribund individuals. The tissues examined were mainly of the brain, thoracic ganglia, and also a pair of muscles running from the occiput to the base of the proboscis on either side of the caudal part of the brain; the stains used were hematoxylin and eosin-y, Bodian's gold chloride and silver albumose method, and toluidine blue. Pyrethrum and two activators thereof—sesame oil and piperine—were found to produce characteristic effects on the brain. The destruction of the fiber tracts and the separation of the tissues by clear spaces are histologic characteristics of pyrethrum poisoning. With piperine poisoning the nerve fibers become very prominent with almost complete destruction of the cellular components. Sesame oil alone produced effects in the nerve cells at extremely high concentrations, but when used at regularly

recommended strengths in combination with pyrethrum, striking histological effects followed, including vacuolation of the brain tissue and degeneration of the nerve cells. The effect of Lethane 384 and D. H. S. Activator on brain tissue was similar to that of piperine in that the nerve fibers became very prominent. Rotenone at lethal concentrations produced no observed histological effect except at strengths sufficient to cause "knock-down," in which case vacuolation of nerve tissues was pronounced. DDT caused slight dissolution of the fiber tracts and degeneration of the nuclei both in the brain and in the fused thoracic ganglia, but in spite of its pronounced neurologic symptoms, histologic changes were relatively slight. The muscles of moribund flies after treatment with pyrethrum showed the nuclei clumped into rodlike dense masses due to the clustering of the chromatin. In flies treated with sesame oil, the muscle nodes and Krause's membrane were greatly accentuated; D. H. S. Activator produced a similar effect on the muscles, but with piperine these effects were less pronounced. Muscles of moribund flies previously treated with Lethane 384 showed destruction of the nuclear membrane. Little or no pathologic change was noted in the muscles of moribund flies that had been treated with rotenone. Evidence is presented that activation is due to the destruction of at least two components, the poison having an affinity for one component and the activator for another, and both at lower concentrations than when each was used alone.

**Pyrethrum as a tsetse fly repellent:** Human experiments, J. R. HOLDEN and G. M. FINDLAY (*Roy. Soc. Trop. Med. and Hyg., Trans.*, 38 (1944), No. 3, pp. 190-204).—An antimosquito cream containing pyrethrum in a vanishing cream base proved of value as a tsetse fly repellent up to at least 6 hr. after application; this action was destroyed by heavy sweating associated with exposure to a hot sun. Supplemental tests tended to show that the action—for man at least—was interfered with more by sweating than by the effect of the sun. Pyrethrum ointment also gave considerable protection against bites of *Culicoides* sp.; a test with *Hippobosca* sp. in cattle showed that this fly will avoid remaining on any area rubbed with this ointment.

**Chemotropic studies on the blow-flies *Lucilia sericata* (Mg.) and *Lucilia caesar* (L.).** J. B. CRAGG and G. R. RAMAGE (*Parasitology*, 36 (1945), No. 3-4, pp. 168-175).—Oviposition by *L. sericata* was induced on a moist clipped fleece by incorporating ammonium carbonate and indole; hence attraction does not depend solely on some factor produced by the living animal. A new method for determining small amounts of  $H_2S$  is described. Larval excreta contains  $H_2S$  but no indole or skatole. Following incubation the  $NH_3$  and sulphydryl contents of various natural attractants are markedly increased. Oviposition was induced in *S. sericata* by 0.002 percent ethyl mercaptan in conjunction with 0.1 percent ammonium carbonate. The mercaptan could be reduced to 0.001 percent providing 0.0001 percent  $H_2S$  was present. The results support the hypothesis that attraction results from the breakdown of cystine, with production of S compounds, coupled with the presence of ammonium carbonate (or of some putrefactive material). During August 17-September 21, 1943, various combinations of ammonium carbonate,  $H_2S$ , and indole in conjunction with sheep wool proved to be attractants for ♀♀ of *L. caesar*.

**'D.D.T.' as a sheep blowfly dip,** J. B. CRAGG (*Nature [London]*, 155 (1945), No. 3935, p. 394).—Preliminary trials proved exceedingly promising for the control of the greenbottle fly *Lucilia sericata* (Mg.).

**Development of a terpene thiocyanate ester (Thanite) as a fly spray concentrate,** R. L. PIERPONT (*Delaware Sta. Bul.* 253 (1945), pp. 58, illus. 14).—A terpene thiocyanate ester has been developed as a fly spray concentrate. This material consists of a blend of thiocyanatoacetates of secondary and tertiary terpene alcohols and is toxic to the house fly in "economically important" concentrations. The

"knockdown" exhibited by this material is slightly slower than that shown by pyrethrum, but is more complete. When low concentrations are used, the knockdown decreases to some extent as the viscosity of the base oil increases; but, with medium and high concentrations, it is maintained at about 99 percent. It is pointed out that this material when used in deodorized kerosene has no harmful effect on protective coatings, plastered walls, wallpaper, or linoleum when such surfaces are sprayed in accordance with the usual procedure. This ester is chemically stable under normal storage conditions, and its efficiency was not affected when exposed to both diffused daylight and direct sunlight for 5 mo. in flint-glass bottles. Information is also included on mixtures of this ester with other insecticides. It is considered to be an effective insecticide which can be safely and economically utilized in commercial household and cattle fly spray formulae. Twenty-five tables are included in an appendix.

Flying stage of the deer lousefly *Lipoptena depressa* (Say) in California (Diptera: Hippoboscidae), J. E. HARE (Univ. Calif.). (*Pan-Pacific Ent.*, 21 (1945), No. 2, pp. 48-57).—At emergence the imago of this common larviparous ectoparasite of deer in western North America possesses fully developed though fragile wings and flies among the trees in the woodland haunts of its host. This stage—here called the "volant"—survives but a few days in the absence of its normal host; on reaching a deer, the volants immediately crawl among the hairs and begin to suck blood. In the course of a detailed study of the complete life history of the species over a 6-yr. period, numerous observations were made on the occurrence and behavior of the volants. This paper is concerned only with that phase and the subsequent events which lead to its finding of a host, including the seasonal occurrence, volant-host ecology, and the diurnal cycle. There are 17 references.

Control of sandflies with DDT, M. HERTIG and R. A. FISHER ([U. S.] *Off. Surg. Gen., U. S. Army Med. Dept. Bul.* 88 (1945), pp. 97-101, illus. 1).—The control of sand flies of the genus *Phlebotomus* has been notoriously unsatisfactory. Experiments during the past summer, however, have shown that DDT is an effective weapon against this group of troublesome and disease-carrying insects. That this method of control may be better understood, pertinent phases of the life-cycle and behavior of sand flies are outlined.

Effect of DDT on cattle lice, J. A. MUNRO and R. KNAPP (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 4, p. 21).—Tests conducted by the station showed that the application of a dusting mixture composed of 10 percent DDT with pyrophyllite gave fairly satisfactory control of the short-nosed cattle louse, *Haematopinus eurysternus*, and the cattle chewing louse, *Bovicola bovis*.

Hog lice control, W. E. SHULL, G. C. HOLM, W. M. BEESON, and H. C. MANIS (*Idaho Sta. Cir.* 103 (1945), pp. 7, illus. 2).—A practical account.

The control of rat fleas (*Xenopsylla cheopis*) by DDT, D. E. DAVIS (*Pub. Health Rpts [U. S.]*, 60 (1945), No. 18, pp. 485-489).—In order to develop an additional method for controlling typhus, laboratory and field experiments were conducted with DDT against its vector the oriental rat flea. Fleas placed in jars with small amounts of DDT died in 4 hr., and rats were found free of fleas after applying small amounts to the fur. The number of fleas per rat in six stores was 13.9 before and 0.6 per month after the dusting treatment of the stores; two stores had an index of 0.2 and 0.5 per rat 4 mo. after dusting. Use of DDT in reducing the numbers of rat fleas is thus practical and should prove of value in controlling typhus.

Ticks of Delaware with special reference to *Dermacentor variabilis* (Say), vector of Rocky Mountain spotted fever, D. MACCREARY (*Delaware Sta. Bul.* 252 (1945), pp. 22, illus. 2).—The American dog tick is widely distributed in Delaware and is becoming increasingly numerous, particularly in New Castle County,

as more and more farms have been retired from cultivation, thus supplying more and better protective covers for the hosts of the immature stages. The dog is thought to be the most important domestic host and the fox the most important wild host. Apparently, time of appearance of adult ticks is dependent upon weather conditions. Collections from dogs over a 2-yr. period showed a difference of about 2 weeks in the first observed activity in the spring. Meadow, pine, white-footed, kangaroo, and house mice, domestic rats, and cottontail rabbits are all hosts of the immature stages of the tick, the first three being the most important under Delaware conditions. Larval and nymphal ticks were obtained during all months of the year except January and February, but the largest collections were made in the early spring months. From 1933 to 1944, 49 cases of Rocky Mountain spotted fever were reported in Delaware which resulted in 9 deaths, or a mortality of 18.4 percent. Sixty-three percent of the total cases occurred during the months of June and July. The following ticks, besides the dog tick, have been collected in the State: *Ixodes dentatus* Neum., *I. cookei* Pack., *I. marxi* Banks, rabbit tick, brown dog tick, Gulf Coast tick, and lone star tick. Species in this group that attack man are rarely taken, but certain of the others are important in transmitting Rocky Mountain spotted fever and tularemia from animal to animal, thus increasing the reservoirs of these diseases among the wild hosts. Control measures for combating the American dog tick are given in an appendix.

The ecology of the sheep tick, *Ixodes ricinus* L., [I, II], A. MILNE (*Parasitology*, 36 (1945), No. 3-4, pp. 112-152, illus. 3; pp. 153-157, illus. 1).

[I]. *The seasonal activity in Britain, with particular reference to northern England.*—Two peaks of ♀ activity per annum were usually found—one in spring and a lesser one in fall, the date limits of the seasons being slightly elastic. For a greater or lesser period in summer the ♀ activity was low or practically absent; in winter it was practically absent. Solar radiation, evaporativity, and humidity, as well as temperatures of the macroclimate were investigated in relation to ♀ activity, with the tentative conclusion that the duration of the humidity level in the daylight period, in conjunction with temperature, may partly decide the amount and extent of activity during summer. In spring—where spring activity obtains—♂ ♂ and ♀ ♀ appear in small numbers a few weeks before the nymphs. The bulk of the ♂, ♀, and nymph spring activity, however, is concurrent, the curves having peaks at approximately the same date. Again—where spring activity obtains—spring larval activity commences later than that of ♂ ♂, ♀ ♀, and nymphs, the peak being about a month later. Theories of seasonal activity are discussed.

[II]. *Host availability and seasonal activity.*—In three tests, the chief hosts (sheep) were withheld from a grazing until 0-3 weeks after the normal peak of ♀ tick activity; this failed to show any appreciable prolongation of ♂ tick activity into the normal summer off season. Over half of the ♀ ♀ actually available during the entire spring season were unfed when activity ended, due to withholding of the hosts. Hence that aspect of the "two-brood" theory, which claims that activity ends in spring because all available ticks are fed, becomes untenable as a complete explanation of bimodal annual activity. Increase in sheep-stocking density above the normal for grazing lowers the average infestation per sheep for at least that season. The findings suggest that: Delay in stocking a grazing with sheep results in a slightly higher-than-normal population of active ♀ ticks which is fairly quickly absorbed after reintroduction of sheep; a varying proportion of tick population becomes active each week throughout the tick season, increasing up to the peak and decreasing thereafter; and the average duration of individual activity in a spontaneous population of ♀ ticks is probably not over a month—perhaps less. Practical applications of the findings to hill sheep farming are indicated.

**Studies of Acari.**—Second series: Descriptions of new species and notes on established forms of parasitic mites, F. A. TURK (*Parasitology*, 30 (1945), No. 3-4, pp. 133-141, illus. 19).—The author here deals with descriptions of some new species of parasitic mites, a fresh study of the forms of *Eulaelaps stabularis* (Koch), some observations on the occurrence of hypopial forms on other parasitic arthropods, and some observations on Radford's Genera and Species of Parasitic Mites (1943).

The anatomy, physiology, and natural history of the honey bee, W. HERRON-HEMPASS (*London, W. C. 2: Brit. Bee Jour.*, 1943, 2. cd., pp. 172+, illus. 120). This compendium considers the bee community; the natural history, anatomy, and physiology of the honeybee; and the secretion and composition of beeswax, and comb building.

**Apicoltura moderna [Modern apiculture],** A. ZAPPI-RECORDATI (*Roma: Ramo Ed. Agr.*, 1944, 2. cd, rev. and enl., pp. 176, about 80 illus.).—A copiously illustrated manual.

Bee venom: Its extraction and therapeutic applications, S. J. HOPKINS (*Mfg. Chem.*, 15 (1944), No. 8, pp. 273-275, illus. 3).

Feeding a dry pollen substitute to bees, W. E. DUNHAM. (Ohio State Univ.). (*Gleanings Bee Cult.*, 73 (1945), No. 5, pp. 192-193, 241, illus. 3).—The author reports on the development, construction, and use of a permanent dry-feeder consisting of a rack holding eight shallow trays, said to have proved successful during the past 3 yr. in feeding honeybees a dry pollen substitute. For best results it is suggested that the pollen substitute be supplied at least 2 weeks before the early spring pollen appears, and then if the natural pollen flow is curtailed because of the weather it should be supplied again until the fruit-dandelion flows occur.

The honey flow and weather data, E. BRAUN (*Gleanings Bee Cult.*, 73 (1945), No. 5, pp. 198-201).—An analysis of weather data from various sources in Canada and in northern and southern areas of the United States in relation to honey flow led to the belief that no solution will be found to the problem of the effects of sunshine, precipitation, and temperature on honey yields until an hourly or two-hourly period of study is made of the quantity and the sugar-concentration of the nectar secreted in individual species of plants, followed by an attempt to correlate these data with the various climatic factors. Furthermore, to render such data of value, they must be arranged in a form suited to statistical analysis. It is also suggested that colonies on weighing scales be contaminated for investigational purposes, and that additional information be gathered on the quantity of sweetclover or alfalfa which is available for nectar secretion within a definite radius of such experimental apiaries.

Cross pollination of fibre flax, A. F. GUBIN (*Bee World*, 26 (1945), No. 4, pp. 30-31).—Tests of the possibility of wind pollination of flax showed the pollen grains to be relatively heavy. Cross pollination by bees increased the yield as measured by both quantity and weight of seed. Flax provided a low honey crop for the bees—about 2 kg. per hectare; with respect to honey yield, it is said to stand lower than any other nectar-yielding plant. Flax also attracts bees but feebly, so that it is necessary to have many hives next to the plot in order to be sure of satisfactory pollination. The author refers (without describing it) to a method of training bees to visit flax which increased their visits by about sevenfold; use of this method would reduce the number of hives needed.

Potato dusting depletes bee population in three New Jersey counties, P. L. HOLCOMBE (*Amer. Bee Jour.*, 85 (1945), No. 5, pp. 157, 165, illus. 1).—The direct cause of the decrease in number of colonies as shown by a survey in this area was found to be the dusting program used by the farmers in controlling various insect pests of potatoes.

## ANIMAL PRODUCTION

**Measuring productive capacity of pastures through maintenance studies with mature steers, A. O. RHOADE and R. B. CARR (U. S. Dept. Agr., Tech. Bul. 890 (1945), pp. 20, illus. 6).**—Productiveness of pastures may be computed on the animal-requirement basis, carrying capacity of the pasture, and the chemical analysis of pasture clippings without introducing large experimental errors. Extreme skill is required to keep animals at maintenance.

In this experiment, conducted at the Iberia Livestock Experiment Farm, Jeanerette, La., during the grazing seasons of 1939-41, three pastures, the productiveness of which was previously determined (E. S. R., 89, p. 438), were used in developing a procedure for evaluating their productiveness and reducing experimental errors inherent in current procedures by the computation of yields from periodic clippings of protected herbage and by the reverse use of feeding standards applied to animal gains. The rate of grazing of steers on the pastures was controlled weekly to maintain weight. Likewise, steers in dry lot were fed sufficient freshly cut pasture grasses and clover to maintain weight, with the composition of the material consumed ascertained. Information was obtained on the nutritional requirements and maintenance of the mature steers on pasture. Adjustments were made at weekly intervals of the areas on which the two groups of steers were permitted to graze and the number of steers on each area ascertained.

The weights of the steers could be maintained within reasonable limits by these methods. For the steers on the adjusted pasture areas, the 3-yr. mean weight throughout the grazing season differed from the 3-yr. average initial weights by only 2.9 percent on one pasture and by only 3.3 percent on the other. The difference for the steers in dry lot was only 0.3 percent. In 277 group weighings, weekly weights per steer were controlled within 1.6 percent of the initial weights. In one pasture there was a net gain of 37.9 lb. per steer during 3 yr., and a net loss of 15.9 lb. in another pasture. There was a net loss of 63.5 lb. in the third pasture. These results indicate that the first pasture was undergrazed and the other two were overgrazed.

The calculated carrying capacity of the three pastures were, per acre, 1,798 lb. of animal weight on one pasture and 2,022 and 1,650 lb. of animal weight on the second and third pastures, respectively. The steers in dry lot consumed 49.7 lb. of herbage daily per 1,000 lb. live weight. According to American feeding standards, this is within the range of theoretical requirements for a 1,000-lb. dry cow plus 25 percent for the "activity factor." It is calculated that the three pastures produced an average of 19,661, 21,461, and 16,662 lb., respectively, of herbage per acre per grazing season. On the basis of pasture clippings, the computed seasonal yield were 24,779, 31,048, and 26,382 lb. of green herbage for the three pastures. These figures were 26, 45, and 58 percent greater than those computed from the observed consumption by steers in dry lot. Therefore, herbage yields computed from observed consumption in dry lot and carrying capacity of pastures resulted in a truer evaluation of productiveness than computations from pasture clippings.

**A suggested explanation for the action of mineral elements on nerve irritability, M. J. CALDWELL and J. S. HUGHES. (Kans. State. Col.). (Jour. Amer. Vet. Med. Assoc., 106 (1945), No. 818, pp. 298-300).**—The four mineral elements most likely to be involved in controlling irritability are Na, K, and Ca, and Mg. Na and Ca are found in relatively small amounts in the tissues in comparison with the amounts in the blood plasma, but K and Mg are in relatively much larger amounts in the tissues. It is the element within the nerve tissue which influences irritability and not those in solution in the plasma. Relationship between these elements and irritability should be more closely understood.

**High-mineral herbage in fertilized pasture, D. M. SEATH and L. L. RUSOFF (Dairy Res. Digest [Louisiana Sta.], 3 (1945), No. 2, p. 2).**—Analysis of the

herbage showed that the calcium, phosphorus, and protein contents were greatly increased in fertilized pasture. As the growing season advanced, the protein and calcium content of the dry matter declined. Fertilization not only increased the yield of dry matter from white Dutch clover but also the protein and calcium contents.

The digestibility of common lespedeza hay, L. L. RUSOFF, D. M. SEATTLE, and G. D. MILLER (*Dairy Res. Digest [Louisiana Sta.]*, 3 (1945), No. 2, pp. 1, 4).—The composition and digestibility of hay cut at the bloom and early-seed stage were ascertained in 10-day trials with four dairy steers. Early cutting of the lespedeza hay is more economical because of the higher percentage of crude protein, ash, and total digestible nutrients (44.70 percent), as the hay cut in the early-seed stage had only 41.03 percent total digestible nutrients.

The composition and digestibility of northern Irish ryegrass seed and ryegrass seed cleanings, R. H. COMMON (*Jour. Agr. Sci. [England]*, 35 (1945), No. 1, pp. 56-63).—The chemical and botanical compositions are presented for ryegrass seed and various byproducts of the cleaning industry. The digestibility was ascertained by the use of wethers for a more limited number of samples of ryegrass seed and byproducts.

Grass silage, J. G. ARCHIBALD and C. H. PARSONS (*Massachusetts Sta. Bul. 425* (1945), pp. 11, illus. 1).—This revision of Bulletin 362 (E. S. R., 81, p. 555) deals with the making of a good quality of grass silage without preservatives by wilting. When for any reason it is impracticable to wilt, some preservative is necessary for succulent grasses and legumes. Corn and small grains never need a preservative if they have reached the dough stage of the grain. Molasses or any kind of ground cereal grains are suitable preservatives. The minimum amount of molasses is 60 lb. per ton of green crop. The recommendation for ground grain preservation is 150 lb. per ton, applied through the blower as chopping proceeds. Unsatisfactory silage preservatives were urea, lactic acid cultures, salt, and a combination of culture and salt. The composition is given of fresh grasses, legumes, grains, and chopped potatoes with alfalfa and oat hay, and of silages made from mixed grasses and mixed grains and legumes. The principal changes in composition from ensiling are a decrease in protein and carbohydrates and a corresponding increase in fat and fiber. A rather complete description is given of a home-made moisture tester previously noted (E. S. R., 91, p. 347).

Phosphoric-acid treatment for meadow-crop silages, C. F. MONROE, C. C. HAYDEN, A. E. PERKINS, W. E. KRAUSS, C. E. KNOOP, and R. G. WASHBURN (*Ohio Sta. Bim. Bul. 234* (1945), pp. 96-102).—Lots of meadow-crop silage were treated with phosphoric acid and compared with similar lots treated with molasses or untreated. The lots graded good, but cows seemed to prefer the acid-treated silage. Untreated and five lots of treated silage with 10 to 30 lb. of phosphoric acid per ton graded about equally good. The silage from alfalfa-clover treated with 16 lb. of phosphoric acid per ton graded low in quality, which was attributed to a low dry-matter content. The pH of the silage of three untreated lots averaged 4.57 and of nine treated lots 4.5. In no case was the pH as low as 4.0. The phosphoric acid, in the amounts used, did not seem effective in the preservation of carotene. In dairy cattle feeding trials, a group of four Holstein and three Jersey cows consumed less phosphoric acid-silage and produced less milk when fed acid-treated alfalfa silage than when fed corn silage during a 50-day feeding period. Another group of cows received corn silage to which no preservative was added. The cows fed the acid-treated silage consumed less silage and produced less milk than when the corn silage was fed. They gained weight on the corn silage and lost weight on the acid-treated silage, but it did not have any harmful effect on the cows. Phosphoric acid is not recommended as a preservative of meadow crop silage.

**Molasses treatment for meadow-crop silage,** C. C. HAYDEN, A. E. PERKINS, C. F. MONROE, W. E. KRAUSS, C. E. KNOOP, and R. G. WASHBURN (*Ohio Sta. Bimo. Bul.* 234 (1945), pp. 102-108).—Meadow-crop silages treated with 40 to 100 lb. of molasses per ton were compared as to the efficiency of molasses in preservation, the acidity produced, and the preservation of carotene. There was heavy loss of juice from such silages which must have resulted in heavy losses of nutrients and much molasses. When rapid-growing, low dry-matter crops are ensiled, some other preserving agent seems necessary.

**The relation of dry matter to quality in meadow-crop silage,** A. E. PERKINS, C. C. HAYDEN, C. F. MONROE, W. E. KRAUSS, and R. G. WASHBURN (*Ohio Sta. Bimo. Bul.* 234 (1945), pp. 108-114).—The results of 67 separate ensilings of meadow crops with and without various popular preservatives were studied to show the effect of dry matter on silage quality. All silages in the highest dry-matter group (30-38 percent) were of high quality, whereas of those below 25 percent dry matter only half were so classified. The pH value did not differ widely between the respective dry-matter groups, but carotene was highest in the wettest silages and lowest in the group showing highest quality in other respects. The proportion of poor silages was no greater in untreated lots than in the whole group. Dry-matter control was clearly more important than the treatment studied. In general, dry silages are inclined to be of high pH and to have an odor and taste more suggestive of hay than of silage. The dry-matter content may be increased by waiting for greater maturity of the crop and better weather conditions or field wilting. Dry materials such as ground grains may be added.

**Urea added to sorghum silage increases value,** R. H. MEANS (*Miss. Farm Res.* [Mississippi Sta.], 8 (1945), No. 5, p. 7).—Sorghum silage treated with about 10 lb. of urea per ton was compared with untreated sorghum silage for wintering mature beef cows and long yearling heifers. Additions of the urea increased feed consumption. A lot of 10 mature cows receiving an average of 35 lb. of untreated silage and 5 lb. of Johnson grass hay lost an average of 99 lb. during the wintering period, whereas another group receiving an equal amount of urea-treated silage and hay gained an average of 13 lb., and an average gain of 9 lb. was made in wintering a third group on 30 lb. of untreated silage, 1 lb. of cottonseed meal, and 5 lb. of Johnson grass hay. The treated and untreated sorghum silages were also used for wintering three lots of 10 beef heifers each with like results.

**The amount of solar radiation and its absorption on the hairy coat of cattle under South African and European conditions,** G. RIEMERSCHMID (*Jour. So. African Vet. Med. Assoc.*, 14 (1943), No. 4, pp. 121-141, illus. 8).—The amount of solar radiation in different parts of South Africa and Europe in the summer and winter months is discussed in part 1, especially with reference to the influence of cloudiness, length of day, and the angle of incidence of the sun's rays. The sun and sky radiation and the radiation reflected from the ground are correlated with the surface area and hair color of cattle. The absorption of radiation on brown and white hides was determined by reflection. The absorption on a brown hide averaged 80 percent of the incoming radiation, but a white hide absorbed only 50 percent. The total radiation absorbed by the body surface of cattle was about 17,000 kg. Calories during a clear midsummer day regardless of whether the animal was exposed on the high veld of South Africa, in the Alpine region of Switzerland, or on the lowlands of central Europe. Comparison showed that brown cattle absorbed approximately three times as much heat from radiation as they produce by metabolism. The incoming solar radiation can be reduced by natural and artificial shade by 60 to 70 percent of the amount which impinges on the animal in the open veld.

**Better management on southern coastal forest ranges,** R. S. CAMPBELL and H. H. BISWELL. (Coop. La., Ga., Ga. Coastal Plain, and N. C. Expt. Stas. et al.). (*U. S. Dept. Agr.*, 1945, *ARS-17*, pp. 12, illus. 9).—This cooperative study indicated that adequate yearlong nutrition for beef production can be obtained from forest range when combined with supplemental feeding, the use of permanent and temporary improved pastures, or both. Grazing on different types of ranges has shown that with wire grass covering the ground there are required about 5 acres per cow for spring and early summer; 8 to 10 acres for spring, summer, and fall; and 15 to 20 acres for the entire year. In other areas where the forage cover is thin, 30 acres per cow may be needed for a 7-mo. season. The average grazing capacity of broomsedge type under heavily cut-over or open-pine stands is about 8 acres per cow for spring, summer, and early fall, whereas 15 acres or more are required for yearlong grazing with supplemental feeding during the winter. Switch cane may be used for grazing in all seasons, but it is highly prized for winter grazing. Grazing capacity varies from 3 to 12 acres per cow for 6 mo. of summer grazing, and about the same amount is needed for 3 or 4 months' winter grazing. Other advantages of grazing are that the fire hazard is reduced to a minimum. Cattle made better gains with a protein supplement, as did also those on improved pasture and dry-lot feeding. Better management and improved breeding practices and marketing occurred with fencing of the range.

**Bagasse for cattle feeding,** H. S. CHATURVEDI (*Jour. Sci. and Indus. Res.*, 3 (1945), No. 9, pp. 404-406).—Both bagasse and molasses—byproducts of the sugar industry—are valuable sources of energy for cattle, especially where pasture land may be scarce. A material made by mixing sun-dried bagasse and passing through 49-mesh screening, with hot molasses, and pressing proved to be a satisfactory cattle feed, and may be stored indefinitely. Bagomolasses can be fed at a maximum of 4 lb. per day, supplying adequate total digestible nutrients but lacking in digestible protein.

**Potatoes tried as cattle fattening feed in tests at station; results are reported,** W. E. CONNELL, L. E. WASHBURN, R. C. TOM, E. M. MERVINE, and J. T. STRATE (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 2, pp. 6-10, illus. 3).—Good gains were made by heifers with dehydrated potato meal and raw potatoes chopped and combined with dry corn fodder or alfalfa hay in silage. Good beef for wartime use was produced quickly with rations including about 5.5 lb. of dehydrated potato meal per day. In these tests 11 lots of about 10 heifers each were fed for 80 days. In another experiment 1 lot of 20 heifers fed for 88 days made average daily gains of 2.31 lb. on a ration of dehydrated potatoes, corn, cottonseed meal, corn silage, alfalfa hay, and minerals. Another lot of 20 heifers receiving dried beet pulp but no dehydrated potatoes made average daily gains of 2.22 lb.

**Feeding Texas lambs,** W. G. KAMMLADE. (*Univ. Ill. Sheep and Goat Raiser*, 25 (1945), No. 8, pp. 28-29, 30).—Comparison was made, in a 92-day feeding experiment, of alfalfa hay and corn silage as roughages in six lots of lambs consisting of 40 or 56 head each. In two of the lots alfalfa hay was fed with shelled corn or shelled corn and soybean meal. In four lots the roughage was corn silage with 0.5 oz. per head daily of limestone. Different amounts of soybean meal were fed with shelled corn in three of the lots, it constituting the single concentrate in one of the lots, and with urea added in another. The average daily gains with the alfalfa hay were 0.34 and 0.38 lb., with the corn silage 0.27 and 0.32, and 0.35 lb. with the soybean meal as the single concentrate. The lambs receiving urea with shelled corn did not eat well and made an average daily gain of only 0.23 lb.

**Lamb and mutton production [in South Africa]: General survey of breeding policies,** L. L. ROUX, D. J. ENGELA, and S. W. BOSMAN (*Farming in So. Africa*, 20 (1945), No. 227, pp. 71-80, illus. 16).

**The value of animal proteins, especially separated milk, in pig feeding, M. H. FRENCH (East African Agr. Jour., 10 (1915), No. 1, pp. 234-237).**—Groups of three and four pigs were fed to 200-210 lb. live weight on grain rations with or without 5 percent meat meal and with or without the addition of separated milk with both of these rations. The pigs with 5 percent meat meal reached bacon weight quicker than pigs without meat meal and with or without separated milk. Additions of separated milk reduced the feed required.

**The nutritive value of potato protein for the pig, J. C. D. HUTCHINSON, J. S. D. BACON, T. F. MACRAE, A. N. WORDEN, and J. O. IRWIN (Biochem. Jour., 37 (1943), No. 5, pp. 550-562, illus. 1).**—Potato protein was compared with barley protein for feeding pigs in rations containing 0, 1, 3, and 6 percent casein. Equal amounts of nitrogen were provided from the two feeds, the total nitrogen of the rations varying from 1.5 percent when no casein was given to 2.4 percent with 6 percent casein. Each barley-fed pig was limited in intake to the amount of dry matter of the feed consumed by the potato-fed partner. The potato nitrogen, whether fed alone or supplemented with casein, was consistently inferior to barley. The weight increase per kilogram of digestible nitrogen varied from 16.5 to 20.3 for barley rations to 13.5 to 15.2 kg. for corresponding potato rations. The kilograms of feed ingested per kilogram of weight increase varied from 3.0 to 4.1 for the barley and 3.5 to 5.6 for the potato rations. Thus, barley was more economically converted into live weight. Casein nitrogen seemed to supplement equally the potato and barley nitrogen, and additions of casein increased the economy in the conversion of both feeds into live weight. There was some evidence that potato-fed pigs were fatter than barley-fed pigs. Likewise pigs receiving no casein or only 1 percent in their ration were relatively fatter for their body weight than those receiving 3 or 6 percent. The average value for the coefficient of digestibility in a mixture of equal parts potato flakes and fresh boiled potatoes was 93.7 percent for energy and 81.5 percent for total nitrogen. These figures corresponded to those for barley of 82.3 and 79.1 percent. Different quantities of casein in the ration did not affect the digestibility of potatoes up to 6 percent, nor was it affected by mixtures of barley up to 50 percent of the ration. When 3 percent casein was added to the barley ration, the rate of increase in weight was about the same as when 6 percent casein was added to the potato ration.

**Trials shed new light on protein needs of pigs (Minn. Farm and Home Sci. [Minnesota Sta.], 2 (1915), No. 3, p. 12).**—In trials with different amounts of proteins for pigs above 50 lb. in live weight, evidently 18 percent protein was unnecessary while 12 percent was too little. Uneven size of pigs at marketing seems to account for differences in response of individuals. In 10 pigs of one lot on 12 percent protein, 6 gained 1 lb. per day, whereas the other 4 gained from 1.3 to 1.4 per day. The least minerals were consumed by the lots receiving the most protein, probably because tankage is high in calcium and phosphorus.

**The nutrition of the bacon pig.—X, The value of extracted palm-kernel meal in the feeding of the bacon pig, H. E. WOODMAN and R. E. EVANS (Jour. Agr. Sci. [England], 35 (1945), No. 1, pp. 44-55).**—In further digestion trials with pigs (E. S. R., 90, p. 514), farm-ground oats, extracted palm kernel meal, course wheat middlings, and fine bran were of equal value in the feeding of bacon pigs. The extracted meal contained no more than 12.1 percent of digestible crude protein and therefore must not be regarded as a protein-rich feed. It may be concluded that this meal, when restricted to 17 to 32 percent of the total ration, is slightly superior to fine bran for bacon pigs, a finding in harmony with the results of the digestion trials. It is definitely superior to the grade of fine millers' offals containing barley husk that was used in these trials. The optimum maximum level of feeding it to bacon pigs lies in the neighborhood of 30 to 35 percent of the

total ration. It is too fibrous for inclusion in more than a small amount in the rations of newly weaned pigs. The amount may gradually be increased above 50 lb. weight, but should be not over 15 to 20 percent until weights of 100 lb. are reached, although higher levels may be fed at about 150 lb.

Studies on the fats of the bacon pig with reference to carcass quality, [I, II], F. B. SHORLAND and P. B. D. DE LA MARE (*Jour. Agr. Sci. [England]*, 35 (1945), No. 1, pp. 33-43).—Two papers are presented.

[I]. *The effect of diet on the component fatty acids of the back fat* (pp. 33-38).—The fatty acid compositions of the back fats of pigs on basic rations of buttermilk or skim milk were determined by ester fractionation. Pigs whose rations were supplemented with copra contained up to 13 mol. percent of myristic acid, with smaller amounts of lauric acid. Evidently dietary linoleic acid is assimilated to a greater extent by slow-growing than by fast-growing pigs. However, greater proportions of the dietary lauric and myristic acids were found in the depots of fast-growing as compared with slow-growing pigs. "The di- and polyethenoid  $C_{18}$  acids of the fat of unsupplemented milk-fed pigs appeared not to contain appreciable amounts of linoleic acid."

[II]. *The relation between growth rate and chemical composition of pig depot fat* (pp. 39-43).—Differences in unsaturation between outer back fat, inner back fat, and kidney fat were essentially determined by differences in the ratio of oleic acid to stearic acid, differences in linoleic acid content being inconsiderable. The growth rate theory does not explain the results found for depot fats in sheep. Differences in the depot fat of pigs and sheep are due to species differences and are not the result of feed or other factors.

Studies on anemia in swine due to pyridoxine deficiency, together with data on phenylhydrazine anemia, G. E. CARTWRIGHT, M. M. WINTROBE, and S. HUMPHREYS. (U. S. D. A. et al.). (*Jour. Biol. Chem.*, 153 (1944), No. 1, pp. 171-182, illus. 1).—Following methods previously employed,<sup>4</sup> studies were made on 27 pigs of the U. S. D. A. Bureau of Animal Industry on the serum bilirubin, percent of reticulocytes in the blood, icterus index, urobilinogen excretion in the stool and urine, urinary excretion of porphyrin, and comparison with anemia induced by phenylhydrazine, which indicate that an increased rate of hemolysis does not occur in pyridoxine deficiency. By restricting the dietary intake of iron in pyridoxine-deficient animals, the hemosiderosis of the tissues was prevented and the ferremia was not only prevented but the serum iron was maintained at as low a level as seen in iron deficiency. The ataxia, convulsions, neurological lesions, and fatty livers of pyridoxine deficiency were not altered by limiting the iron intake in the combined deficiency. In pyridoxine deficiency urinary excretion of iron is insignificant and not different from the normal. The increased iron in the serum of pyridoxine-deficient animals is in the ferric state. Ineffectiveness in stimulating blood formation in pyridoxine-deficient animals under the conditions of this experiment was noted for chyorphyll, sodium magnesium chlorophyllin, antipernicious anemia liver extract, tryptophane, corn oil, crude hemoglobin, hemin, and iron ascorbate. The continued absorption or decreased excretion of iron at a time when its utilization for hemoglobin formation is at a minimum and when body tissues have abundant iron resulted in the ferremia and hemosiderosis. Thus the absorption of iron appears to be dependent on other conditions than the need of the body for iron.

Indiana stallion enrollment.—Thirty-first annual report of stallion enrollment board for the year 1944, with lists of stallions and jacks enrolled (*Indiana Sta. Cir.* 303 (1944), pp. 32, illus. 1).—A list of the stallions and jacks enrolled for service in 1944 in Indiana (E. S. R., 91, p. 185), with an article on Horse and

<sup>4</sup> *Bul. Johns Hopkins Hosp.*, 67 (1940), No. 6, pp. 377-405, illus. 14.

Mule Production From the Farmer's Point of View, by F. C. Beall.

Horsemanship and horses, A. J. CARABELLI (*Washington, D. C.: Washington Bridle Trails Assoc., 1945, pp. [19]*).—A brief annotated bibliography of books on horses in North America and on horsemanship published since 1900.

The wild horse of the West, W. D. WYMAN (*Caldwell, Idaho: Caxton Ptrs., 1945, pp. 348, illus. about 50*).—A descriptive account.

Dogs at war, C. G. GOING (*New York: Macmillan Co., 1945, pp. 179+, illus. 35*).—A descriptive account.

The care and management of Angora rabbits, W. T. GRINSTEAD (*Edwardsville, Ill.: Grinstead Angora Colon., 1945, pp. 100+, illus. 30*).—A popular book setting forth the principles of Angora rabbit production.

The golden hamster (*Cricetus auratus*): Care, breeding, and growth, C. R. BOND (*Physiol. Zool., 18 (1945), No. 1, pp. 52-59, illus. 2*).—A description of housing, feeding, breeding, and growth.

Rock phosphates as phosphorous supplements for the growing chick, L. D. MATTERTON, E. P. SINGSEN, and H. M. SCOTT. ([Conn.] Storrs Expt. Sta.). (*Poultry Sci., 24 (1945), No. 2, pp. 188-190*).—Tricalcium phosphate, raw rock phosphate, fused rock phosphate, and calcium metaphosphate were used to supplement a low-phosphorus basal diet, such that when the diet contained 0.45 percent total phosphorus over 50 percent of it was contributed by the supplement. The results, as measured by the percentage of ash in the tibia of 4-week old chicks, indicate (1) that the phosphorus of the calcium metaphosphate was markedly less available for bone calcification than that of tricalcium phosphate, the difference being statistically highly significant, and (2) that the phosphorus of fused rock phosphate and raw rock phosphate was as available as that of tricalcium phosphate. All the rock phosphates used were manufactured by the Tennessee Valley Authority.

[Contributions to poultry science] (*World's Poultry Sci. Jour., 1 (1945), No. 1, pp. 33, illus. 2*).—This first issue of the journal includes the following brief papers: International Co-ordination in the Poultry Industry, by E. Brown (pp. 6-8); Poultry Work in Some European Countries Before World War II, by W. A. Kock, A. Horn, and L. Svendsen (pp. 13-14); Eggs—A Highly Nutritious and "Protective" Food (pp. 15-16); Rebuilding Poland's Poultry Industry To Provide Eggs for Children's Health, by M. Gutowska (pp. 17-20); Air Shipments of Hatchling Eggs to Brazil and Peru, by M. A. Jull (pp. 21-22); Importance of Developing the Poultry Industry in China, by Z.-T. Tsang (pp. 23-27); the Poultry Industry in Yugoslavia, by M. Milovanich (pp. 28-30); Delectable Fried Chicken (p. 31); and Post-War Food Production Problems in Europe, by M. A. Jull (pp. 32-33).

The South African poultry book, C. W. SMITH ([Johannesburg]: Cent. News Agency, 1944, pp. 331+, illus. about 25).—General information on poultry production, including chickens, turkeys, ducks, and geese, with special reference to their application to South Africa.

Poultry husbandry in hot climates—experimental enquiries, D. H. K. LEE, K. W. ROBINSON, N. T. M. YEATES, and M. I. R. SCOTT (*Poultry Sci., 24 (1945), No. 3, pp. 195-207, illus. 6*).—Study was reported on observations in Queensland of the effect of different atmospheric changes, particularly air temperature, humidity, air movement, and radiant energy for different intervals of exposure on such physical conditions as rectal temperature, respiration rate, and evaporation loss in the White Leghorn, Brown Leghorn, Minorca, White Wyandotte, Australorp, and Rhode Island Red breeds. The reactions were all within the normal range for these breeds at intermediate temperatures, but at 105° and 25 percent relative humidity the White Leghorn showed the least rise in temperature, the Brown Leghorn the most, and the Australorp and Rhode Island Red intermediate. When the humidity was raised to 75 percent, the Brown Leghorn was the least and the

Australorp and Rhode Island Red the most reactive, with the White Leghorn and Minorca intermediate. Generally speaking, the Australorp and Rhode Island Red withstand heat least effectively. The poor economic state of poultry in Australia makes the producer unable to install improvements in these respects, particularly because of the cost involved and the poor returns for labor invested and the hazards incurred. Improved industry could maintain scientific control of breeding and laying conditions.

The basal metabolic rate in molting and laying hens, M. PIREEK and F. SULMAN (*Endocrinology*, 36 (1945), No. 3, pp. 240-243).—The basal metabolic rate of 20 normal laying Leghorn hens averaged 400-500 cc. O<sub>2</sub> per kilogram per hour. In 8 hens the basal metabolic rate was the same before and after molting but increased to 600-700 cc. O<sub>2</sub> per kilogram per hour during molt. Checking or accelerating molting with Lugol's solution or diethylstilbestrol administered per os failed.

Sexual maturity, adult mortality, and egg production of White Leghorn pullets in relationship to their diet during the growing period, C. S. PLATT and H. W. STOVER, JR. (*New Jersey Sta. Bul.* 716 (1945), pp. 19, illus. 3).—By the use of different rations and feeding methods, groups of White Leghorn pullets were reared which varied from 1.14 to 1.72 lb. in average body weight when 12 weeks of age. Retarding the growth within this range resulted in an increase in chick mortality, but there was no significant effect on body weight, egg production, or mortality of mature birds. The exclusion of all protein concentrates from the rations of White Leghorn pullets on grass range from the age of 12 weeks to the start of egg production, with mineral balance maintained, resulted in a delay of 1 week in sexual maturity and a lowering of mortality during the period of feeding, but no difference in the body, weight, egg production, or mortality of the adult birds. The exclusion of mash from the rations of White Leghorn pullets on grass range from 12 weeks to the start of egg production delayed sexual maturity approximately 8 weeks, and there was a tendency for such birds to lay at a heavier rate. Mortality was not affected during the year of production. The feed required to rear pullets to maturity increased as the growth rate was retarded, the cost depending on the relative cost of feeding materials used in the promotion of growth. Retarding growth and maturity did not appear to be a sound practice for pullets hatched in March or April, but could be followed without permanent injury to the birds. The best practice for such a program appeared to be the feeding of grain only after the pullets were 12 weeks old or weighed from 1.5 to 1.7 lb., with unlimited range available.

Free-choice grain feeding wins approval, H. J. SLOAN (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 2 (1945), No. 3, pp. 8-10, illus. 2).—The free-choice feeding of layers, because of its simplicity and saving of labor, seems acceptable, but differences were found in the responses to different grains and the reaction of certain individuals and breeds. The objection commonly raised against free-choice feeding for hens—that they consume too much grain, become fat, and quit laying—has not been substantiated.

The value of four characters used in culling ready-to-lay pullets, R. F. BALL. (Cornell Univ.). (*Poultry Sci.*, 24 (1945), No. 3, pp. 216-225, illus. 3).—The value of fleshing, shank color, symptoms of colds, and presence of irregular pupils in culling for production and mortality in 2,155 Single-Comb White Leghorn pullets was investigated. Poor fleshing of ready-to-lay pullets was indicative of a high rate of mortality from 160 to 500 days of age. Neoplasms and respiratory and miscellaneous diseases were particularly significant. A strain which had a mortality of 47.9 percent from all causes had a greater proportion of its pullets classified as having poor or moderate fleshing than the pullets of a strain which

had a mortality of 33.5. There was also a slightly lower egg production among pullets with poor and moderate fleshing. There was a greater proportion of those with pale shanks in the susceptible than in the resistant strain. Within these strains pullets classified as having pale shanks died at a greater rate than pullets whose shanks were well pigmented. There was no relation between shank color and incidence of colds or egg production to 500 days of age. Total mortality was no greater for birds that had colds at housing than for these free of colds. There was a slightly lower incidence of neoplasms in birds with colds, but this was increased by the greater increase in deaths due to respiratory causes. The egg production of cold-free pullets was from 5 to 13 eggs greater for pullets infected with colds at housing time. Pullets with irregular pupils had a higher rate of mortality than was observed in those with regular pupils at housing time. The mortality of the flock would have been reduced 4 to 5 percent by culling 25 percent of the pullets at housing on the basis of three of the measures—fleshing, shank color, and regularity of the pupils.

**Observations on two methods of feeding chickens from one day old to twelve months of age, M. NOVIKOFF and J. BIELY (*Poultry Sci.*, 24 (1945), No. 3, pp. 245-251).**—Two groups of 125 Single-Comb White Leghorn pullets were fed from 1 day to 12 mo. of age to compare two different rations and methods of feeding. In one lot the ration fed did not include starchy feeds, but consisted mainly of feeds rich in protein, minerals, vitamins, and fiber. The starchy ration was fed ad libitum, but the other ration was fed at 8 a. m. with sufficient feed to last to 1 p. m. Green feed was then usually given this group, and, following a 2- to 3-hr. interval with no feed, whole grain was provided in hoppers. Considerably more labor was required with the restricted system of feeding, but there were no significant differences in the pathology or egg production of the two groups.

**Condensed fish press water and fish liver meal in chick rations, E. P. BERRY, C. W. CARRICK, R. E. ROBERTS, and S. M. HAUGE. (Ind. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 3, pp. 270-276).**—The value for growth of fish press water and fish liver meal as supplements to simplified rations, largely of ground yellow corn and soybean meal, was investigated in five trials with Barred Plymouth Rock chicks during 6 or 8 weeks.

The first trial consisted of 3 lots of 35 chicks each. All received 0.5 percent whey solubles, with nicotinic acid, pantothenic acid, choline, and riboflavin added to the first lot. A tremendous increase in growth was produced in the second and third lots by the additions of 2 or 4 percent of fish press water in place of the B vitamins mentioned, indicating that the fish press water contained an adequate amount of nicotinic acid, pantothenic acid, and choline for satisfactory chick growth, since these were not included in the rations fed lot 1.

In the second trial 5 lots of 35 male chicks each were started. One lot had an addition of 2 percent gelatin with the B vitamins, but the chicks averaged only 359 gm. at 6 weeks, which was not comparable to the growth produced in trial 1 with 2 percent fish press water. With 1 percent fish press water, the average weight at 6 weeks was 398 gm., with 2 percent press water 484 gm., and with 3 percent fish liver meal 494 gm. A highly significant decrease in growth occurred when riboflavin was omitted. Growth with 3 percent liver meal equaled that with 2 percent fish press water and riboflavin.

In the third trial 8 lots of 38 male chicks each were started. A deficiency in riboflavin concentrate was readily corrected by increasing the whey solubles from 0.5 to 1 percent. One percent of fish press water supported practically the same growth as 2 percent. Additions of 4 percent gelatin proved of no real benefit in the growth to 6 weeks. The water-soluble fraction of fish press water carried most of the growth-promoting properties.

In the fourth trial there were 4 lots of 40 chicks each. Three received 2 percent fish press water and one of these also received alfalfa leaf meal, whereas others received liver meal, casein, or dried skim milk. All of these made good growth to 8 weeks of age.

In the fifth trial there were 8 lots of 49 chicks. Three of these received decreasing amounts of soybean meal with 2 percent fish press water in all of them. As the protein level decreased from 22 percent, growth decreased. When riboflavin was added, 1 percent fish liver meal was as effective as 2 percent fish press water, but 3 percent sardine meal was inferior. In the rations used, 20 to 22 percent protein was necessary to give maximum growth. Fish press water did not adversely affect the flavor of the cooked chicken.

**Distillers' dried solubles in chick rations containing corn and vegetable protein supplements,** J. A. MARVEL, C. W. CARRICK, R. E. ROBERTS, and S. M. HAUGE. (Ind. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 3, pp. 252-258).—In a series of experiments continuing methods previously employed (E. S. R., 91, p. 730), a 5 percent level of distillers' dried solubles failed to supplement adequately a simplified ration consisting of 20 to 50 percent of ground yellow corn and 25 to 40 percent of soybean meal, cottonseed meal, or peanut meal with riboflavin, pantothenic acid, and choline, but a 10 percent level of dried solubles was satisfactory for rapid growth. Peanut meal satisfactorily replaced soybean meal in the rations. The study was conducted in five trials with a total of 51 lots of about 25 Barred Plymouth Rock ♂ or ♀ chicks each. The rations of different lots were and were not supplemented with different amounts of riboflavin, calcium pantothenate, nicotinic acid, pyridoxine, hydrochloride, and choline chloride. The supplemental value of various wheat byproducts was ascertained. The live weights of the chicks were determined at 6 and 8 weeks of age. All lots received vitamin D-activated animal sterol or vitamin A and D in oil. In all, a total of 51 lots of chicks were included.

**Amino acid absorption and utilization in the chick,** F. H. KRATZER. (Univ. Calif.). (*Jour. Biol. Chem.*, 153 (1944), No. 1, pp. 237-247, illus. 3).—The rates of absorption of amino acids from the gastrointestinal tract of the chick were determined to vary inversely with the apparent molal volume of the amino acid. In general, the blood amino nitrogen increases after the absorption of amino acids from the gastrointestinal tract in proportion to the amount of amino nitrogen absorbed. Methionine and leucine caused disproportionately high levels of blood amino nitrogen, while aspartic acid, glutamic acid, tyrosine, and phenylalanine on oral administration caused low levels of blood amino nitrogen. There was a greater increase in the blood amino nitrogen of the chick than results from the administration of intact protein. With each of the amino acids tested, there were lots of 5 to 12 chicks each, totaling 152.

**Further studies on cystine, methionine, and choline in chick diets,** H. J. ALMQUIST and C. R. GRAU. (Univ. Calif.). (*Jour. Nutr.*, 29 (1945), No. 3, pp. 219-222).—Continuing these studies (E. S. R., 92, p. 257) with the chick, rations deficient in methionine and cystine were fed with increasing levels of cystine up to the optimal sulfur amino acid content with various levels of choline additions. Growth was no better with 0.6 percent choline than with 0.4 percent per day. This substitution of part of the cystine by methionine so that the total methionine content of the ration was 0.55 percent produced optimal gains of 6 percent per day. Cystine apparently cannot compensate for a methionine deficiency even if higher levels of choline are employed.

**Tolerance of chicks for diets high in tyrosine,** D. C. HILL, S. J. SLINGER, and F. N. MARCELLUS (*Poultry Sci.*, 24 (1945), No. 3, pp. 234-236).—Day-old chicks were fed a typical chick-starting ration to which was added L-tyrosine in amounts of 0.5, 1, 2, and 3 percent. Such birds grew normally for 3 weeks and showed no evidence of toxic symptoms. Feeding a ration consisting of 91 parts of the

basal ration and 9 parts of tyrosine resulted in slow growth, but in 4 weeks no other visible external symptoms or internal abnormalities were noted. Ascorbic acid was added to five of the rations at the rate of 1 gm. per kilogram of feed. As the tyrosine in the ration was increased, there was a decrease in the ascorbic acid content of the liver. The study was conducted with 12 lots of 4 Barred Plymouth Rock cockerels each.

**Vitamin A intake of chickens fed mash and grain free choice,** W. O. WILSON, F. R. SAMPSON, A. L. MOXON, and T. M. PAULSEN. (*S. Dak. Expt. Sta. (Poultry Sci., 24 (1945), No. 3, pp. 237-240, illus. 1)*).—Four lots of New Hampshire pullets and 2 New Hampshire cockerels each were hopper-fed a mash of ground yellow corn, ground oats, wheat middlings, alfalfa leaf meal, meat and bone scraps, dried buttermilk, soybean meal, steamed bone meal, ground oyster-shell, salt mixture, and fish-oil concentrate, so that it contained 19.25 percent protein. Whole grains were fed in the hoppers of different lots as follows: Yellow corn, wheat, barley, and all three grains in separate hoppers in one lot. The mash was calculated to contain 6,600 International Units of vitamin A per pound. Avitaminosis A was designated as the cause of death in hens which died in the several lots during the experiment. After 24 weeks on the mash and whole wheat, 60 percent of the hens had died and the plasma of the living hens averaged 0.1746 mg. percent, as contrasted with 3.550, 0.2424, and 0.3546 mg. for the hens receiving corn, barley, and the mixture of the several grains. When either barley or wheat are fed ad libitum, it is suggested that the mash be fortified with vitamin A so that if only 20 percent is consumed the vitamin A intake will be sufficient.

**The rôle of crystalline vitamin B<sub>1</sub> in the nutrition of the chick,** C. J. CAMPBELL, R. A. BROWN, and A. D. EMMETT (*Jour. Biol. Chem., 154 (1944), No. 3, pp. 721-722*).—Tabulated data show similar results from adding B<sub>1</sub> to the diet of chicks by oral feeding and by subcutaneous injection. The authors suggest that the intestinal flora is probably not influenced directly and that the effect observed on growth and blood cell components is due to the vitamin B<sub>1</sub> per se.

**Metabolism of vitamin D in the chick,** E. W. McCHESNEY (*Soc. Expt. Biol. and Med. Proc., 58 (1945), No. 4, pp. 300-303, illus. 1*).—Studies of the metabolism of vitamins D<sub>2</sub> and D<sub>3</sub> by the chick (E. S. R., 92, p. 104) showed from assays of the carcasses and the feces that the chick does not absorb D<sub>2</sub> as well as D<sub>3</sub>, at least in the doses given. The study was conducted with 14 groups of 4 chicks each, to which doses of either of the two vitamins were administered orally and the amounts recovered in the feces and carcasses ascertained. On the first, second, third, fourth, fifth, seventh, and tenth days after administration, groups of the chicks were decapitated and the entire digestive tracts and their contents analyzed, as well as the carcasses. Larger proportions of D<sub>2</sub> than D<sub>3</sub> were found in the feces and less in the carcass. About 35 percent of D<sub>2</sub> cannot be accounted for. There are two phases of inactivation. In the first, both of the vitamins are inactivated at about the same rate, but in the second phase destruction of D<sub>2</sub> is about 50 percent greater than of D<sub>3</sub>. The generally more rapid inactivation of D<sub>2</sub> in the tissue may have a bearing on the fact that this vitamin is less effective in the chick than is vitamin D<sub>3</sub>.

**Electric chick brooding studies,** F. D. YUNG and F. E. MUSSERL (*Nebraska Sta. Cir. 80 (1945), pp. 19, illus. 8*).—Comparison was made of the mortality, temperatures, and average weights of the cockerels at 4 weeks of age and the electricity used in 14 types of insulated and noninsulated brooders, starting with 200 chicks each for the seasons of 1937 to 1940, inclusive. The brooders were differently heated and ventilated, some having removable tops.

The effect of certain feedstuffs on the flavor, albumen condition, and yolk color of eggs, J. H. VONDELL and J. N. PUTNAM. (Mass. State Col.). (*Poultry Sci.*, 24 (1945), No. 3, pp. 284-287).—All the eggs produced by Rhode Island Red pullets on a complete laying ration in batteries for a 2-week period were normal in appearance, odor, and flavor on opening. One-half of the 12 birds was fed heavily for 28 days on the feed tested, and the other half received a lesser amount of feed. The opened eggs were scored for odor, interior quality by the Van Wagenen-Wilgus photographic standards (E. S. R., 75, p. 243), and yolk color by the Heiman-Carver color rotor (E. S. R., 75, p. 243). The rations fed included fresh cabbage, ground and mixed with the mash, 2:1 and 1:2; garbage fed after grinding with mash, 1:3 and 1:1; and sardine oil fed at the rate of 1 cc. per chick per day. Although some of the eggs graded up to 3 on odor, they were not in the least objectionable, and slight differences could only be detected by one with a keen sense of smell. There were even less differences in the cooked eggs than were apparent in the raw eggs.

Duck farming, P. J. SERFONTEIN (*Union So. Africa Dept. Agr. and Forestry Pam.* 248 (1944), pp. 55, illus. 36).—A general description is given of duck farming in South Africa. The breeds are grouped and described. Directions are given for feeding, killing, and dressing, including plucking and removing pin feathers by the wax method. Descriptions are also given of housing, marketing, and diseases.

Embryo mortality accompanied by pasty eyes and severe losses in ducklings associated with avitaminosis, E. H. PETERSON, C. C. MORRILL, and R. GRAHAM. (Univ. Ill.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 19, pp. 96-102, illus. 5).—Severe embryo mortality and heavy death rate of ducklings which hatched were noted on a large duck farm. The breeding stock was visibly normal, and egg production and fertility were near normal levels. Substitution of feed from a new shipment for the musty product in use promptly reduced losses, which were thought to result from a vitamin A deficiency in the rancid feed caused by oxidation losses. Chemical examination of the blood of 15-day-old affected and normal ducks showed no significant differences in blood sugar, inorganic phosphorus, or hemoglobin. Plasma carotene was significantly higher in the normal than in the affected ducks. There were between 2,000 and 4,000 eggs set in each of 19 hatches.

## DAIRY FARMING—DAIRYING

How cows react to hot weather, D. M. SEATH and G. D. MILLER (*Dairy Res. Digest [Louisiana Sta.]*, 3 (1945), No. 2, p. 3).—Milking cows of the university herd were definitely affected by changes in atmospheric conditions, especially temperature. Different breeds and individuals reacted differently. Body temperature increases were less with external temperature changes in Jerseys than in Holsteins. Differences in the rise in temperature and respiration rates of the progeny of different sires were noted. Temperature and respiration of cows tended to be lower during cloudy and rainy days, and cows grazed more during these periods.

Four methods of estimating the weight of a dairy cow, E. G. MISNER (*Cornell Univ., Dept. Agr. Econ.*, A. E. 479 (1944), pp. 8+, illus. 1).—The combined body, heart, and neck girth method of estimating weights came within 10 lb. or less of the actual weight on 19 percent of 100 dairy cows of 5 breeds in the Cornell dairy herd. The body volume method came within 10 lb. or less on 10 percent of the cows when the average weight per cubic foot was used for the 100 cows, and on 20 percent of the cows when the average weight per cubic foot as calculated for each breed was used.

**The water buffalo of India.** R. W. PHILLIPS. (U. S. D. A.). (*Jour. Hered.*, 36 (1945), No. 3, pp. 71-76, illus. 3).—The eight breeds of water buffalo need a large amount of water for bathing or sprinkling in hot weather. A reasonably copious quantity of white milk low in carotene and about 7.5 percent fat is produced. A considerable amount of coarse roughage is consumed.

**Protein sources and supplements for dairy cows in Hawaii.** L. A. HENKE (*Hawaii Sta. Bul.* 95 (1945), pp. 21+, illus. 4).—Results are briefly presented of several experiments and observations with protein supplements in rations for dairy cattle. Sesame meal, cottonseed meal, cane molasses yeast, dried koa haole forage meal, and dried garbage were used as substitutes for soybean meal. Koa haole soiling and pasture crops and pigeon pea forage were also used as protein roughages with the regular feeds. Milk production per day on the different feeds was ascertained.

**Alfalfa with and without concentrates for milk production.** V. R. SMITH, I. R. JONES, and J. R. HAAG. (Oreg. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 5, pp. 343-354, illus. 6).—Study was made of the effect on milk production of various concentrates, which included blood meal, dehydrated beet molasses, dried molasses beet pulp, pilchard fish meal, meat meal, oat groats, peanut meal, skim-milk powder, cornstarch, sugar, soybeans, soybean meal, wheat bran, and wheat middlings, when replacing equal amounts of total digestible nutrients in alfalfa hay rations supplemented with salt and phosphorus. The feed changes were made at 28-day intervals for one or others of the six cows when fed from 3 to 9 weeks after calving. In general, the feeding of alfalfa hay alone was followed by periods of 28 days when different concentrates replaced 5 or 10 lb. of alfalfa hay, followed by a period in which alfalfa hay alone was fed, and subsequently with supplementary concentrates, etc., throughout lactation. The digestible protein intakes were kept at the same level as when alfalfa hay alone was fed by mixing the concentrates with starch or sugar, except when the protein content of the concentrate was lower than alfalfa. The results showed that good-producing dairy cows do not utilize a ration of alfalfa hay supplemented only with minerals as well as when part of the alfalfa hay is replaced by calculated equal amounts of total digestible nutrients in the various concentrates. In general, the results were strikingly similar to those presented by Huffman and Duncan (E. S. R., 92, p. 408). There was no indication of a betterment in quality of protein, but the best results were obtained with ground soybeans, followed in turn by high and medium protein feeds from plant sources, dried molasses beet pulp, animal protein feeds, dehydrated molasses, and sugar. The total digestible nutrient system of feed evaluation overrates the production value of good alfalfa hay when fed only with minerals to good cows. There is included a list of 27 references on the nutritive value of alfalfa hay for milk production.

**The relationship between a low carotene intake and urinary excretion of ascorbic acid in dairy cattle.** L. A. MOORE and J. W. COITER. (Md. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 6, pp. 495-506).—In normally fed heifers of several dairy breeds but mostly Holsteins, the ascorbic acid eliminated in the urine varied from 25.8 to 110.5 mg. per day. When 5 gm. of chlorobutanol were fed daily for 10 days, the heifers excreted 210 to 399 mg. of ascorbic acid per day. In pregnant heifers receiving a ration low in carotene, the ascorbic acid excretion was from four to six times greater than in animals normally fed, but with 5 gm. of chlorobutanol a ration low in carotene stimulated the excretion of vitamin C very little. Chlorobutanol caused an increase in plasma ascorbic acid values of normally fed pregnant heifers. Varying levels of vitamin C were excreted by dairy ♂♂ regardless of the carotene intake, except that the ascorbic acid excretion was very low in animals severely deficient in carotene. Normally fed ♂♂ excreted more than ♀♀. The depressing effect on ascorbic acid synthesis of low carotene

intake has a questionable influence on ascorbic acid synthesis to the extent of altering breeding efficiency. A bibliography of 25 references is included.

Studies on ketosis in dairy cattle.—VI. Is ketosis in dairy cattle due to a vitamin A deficiency? J. C. SHAW, L. D. MATTISON, M. E. SURGENOR, and C. A. HOURIGAN. ([Conn.] Storrs Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 818, pp. 285-291).—In continuing these studies (E. S. R., 91, p. 189), the averages of blood plasma carotene and vitamin A of eight cows diagnosed from symptoms and blood analyses as having uncomplicated ketosis were 324.5 and 23.2  $\mu$ g. percent, respectively. From the results reported by Moore et al. (E. S. R., 92, p. 107) and by others, these values were deemed apparently normal. No beneficial effect was produced by oral administration for as long as 3 weeks of 1 to 4 million International Units of vitamin A, but pasture grass promoted recovery of the cows exhibiting ketosis.

Artificial insemination of dairy cows, E. J. PERRY and J. W. BARTLETT (*New Jersey Sta. Cir.* 491 (1945), pp. 20, illus. 13).—Directions for the artificial insemination of dairy cows, including methods of management and handling of bulls, are described.

Recent advances in lactational endocrinology as applied to farm animals, S. J. FOLLEY (*Vet. Rec.*, 56 (1944), No. 2, pp. 9-10).—A review of the role of endocrines in lactation as reported in the literature, particularly the estrogens and iodinated casein as mentioned by Reineke and Turner (E. S. R., 89, p. 435).

Studies of the carbohydrate metabolism of mammary gland tissue in vitro.—I. Production and utilization of various carbohydrate substances, C. B. KNOTT and W. E. PETERSEN. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 6, pp. 415-429).—In a series of 20 experiments, the low glycogen level of udders removed from the abattoir was increased by perfusion with high concentrations of blood glucose by methods previously described (E. S. R., 85, p. 242). The average glycogen content of the udder before perfusion was only 25.11 mg. percent, due to catabolism during transportation from the abattoir. After perfusion, one-half of the gland averaged 231.7 mg. percent glycogen. The glycogen formed by perfusion was converted to lactose by incubation of the perfused tissue, but it was not proved that this was the path of lactose formation in the mammary gland, although it suggested possible methods of formation. Glycogen could not be increased in incubating tissue strips from glucose, lactic acid, pyruvic acid, and citric acid individually, and in combination of these, as well as in the presence of added glycogen. Lactose was formed by incubation of mammary tissue slices with glucose, glucose and lactic acid, maltose, and glycogen. Lactic acid was formed from incubating tissue alone, as well as from added glucose, maltose, glycogen, pyruvic acid, and citric acid. A list of 49 references is included.

The use of simplified diets in the study of the fat metabolism of the mammary gland, O. W. KAUFMANN and J. C. SHAW, ([Conn.] Storrs Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 6, pp. 467-472).—In a further study of the relationship between food intake and synthesis of the lower fatty acids of milk fat by the cow (E. S. R., 88, p. 672), it was found that the precursors for the synthesis of the lower fatty acids of milk fat may be provided by carbohydrates as the sole ration. Blood glucose does not appear to be the blood precursor of the lower acids, and therefore the carbohydrate in the ration must act indirectly. Micro-organisms in the rumen may play a part in the carbohydrate conversion. Possibly the carbohydrate may exert a sparing action on the utilization by other body tissues of substances which act as precursors of the lower fatty acids of milk fat. Marked changes were noted in the Reichert-Meissl values and iodine values of milk fat after 24 to 36 hr. of fasting. Composite samples of milk were taken at intervals following the feeding of a basal ration or rations of skim

milk, skim milk plus skim milk powder, skim milk plus fat and glucose, starch, starch plus glucose, and casein, and after fasting for 48 and 84 hr. by two cows, respectively. As needed, the rations were force-fed by a stomach tube.

The hormones regulating milk secretion, C. W. TURNER (Univ. Mo.) (*Guernsey Breeders' Jour.*, 67 (1945), No. 9, pp. 912-916, illus. 6).—The growth of the milk-secreting tissue of the udder is stimulated during pregnancy by progestin. Parturition results when estrogen production overrides the physiological effect of progestin, and the secretion of lactogen initiates secretion in the cells of the udder. To maintain lactogen secretion the milk must be removed from the udder regularly.

Stimulating compound given second trial, D. M. SEATH, C. BRANTON, and A. H. GROTH (*Dairy Res. Digest [Louisiana Sta.]*, 3 (1945), No. 2, p. 1).—Results in two experiments would not justify the feeding of iodinated casein to milk cows during the summer months. An increase in milk production occurred in the first 5 weeks, after which the milk was reduced. Higher fat tests continued for 6 of the 13 weeks of the experiment. Body weight losses were not as heavy in the second as in the first experiment. Iodinated-casein feeding caused accelerated pulse rates averaging 13 beats per minute higher, and a rise of 0.68° F. in body temperature was observed.

Study of the arterial and lymphatic systems in the udder of the cow, I, II, M. A. A. M. EL HAGRI (*Vet. Jour.*, 101 (1945), Nos. 2, pp. 27-33, illus. 4; 3, pp. 51-63, illus. 10).

The arterial system of the udder of the cow, M. A. A. M. EL HAGRI (*Vet. Jour.*, 101 (1945), No. 4, pp. 75-88, illus. 9).

Reliability of averages of different numbers of lactation records for comparing dairy cows, J. C. BERRY. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 5, pp. 355-366, illus. 2).—"Formulae which describe the relative reliability for prediction purposes of averages based on different numbers of records have been presented. The major increase in reliability occurs when a second record becomes available to use along with the first. The addition of a third record adds considerably to the reliability of the estimate. Records beyond the third do contribute more information, but so little that they scarcely appear to be worth waiting for before estimating the consequences of keeping or culling the cow herself or her offspring. It is concluded that cows can be compared fairly, without bias because of differences in number of records, by use of the following prediction equations: (1) Real producing ability ( $W$ ) = herd average +

$\frac{nw^2}{1 + (n - 1)r}$  times (cow's average-herd average); (2) transmitting ability or

breeding value = herd average +  $\frac{2nq}{1 + (n - 1)r}$  times (cow's average-herd average).

In these equations  $n$  is the number of records in the cow's average,  $r$  is the average intra-herd repeatability of records of the same cow (usually of the order of 0.3 to 0.5),  $q$  is the average intra-herd correlation between dam and daughter records (probably not far from 0.1 generally) and  $w^2$ , which is that part of  $r$  left after the effects of proximity are removed, is believed to have a value of approximately 0.03 to 0.09 less than  $r$ ." The data used were from the Herd Improvement Register Yearbooks up to and including volume 10, giving (1) correlations of butterfat records of all (454) cows which had completed six or more lactations, (2) the butterfat record of all (979) those dams and daughters, of the six-record cows, which had completed at least one record of production, (3) the first two butterfat records of all (661) dams and daughters of the six-record cows which had completed at least two records, and (4) identification of each six-record cow with the herd in which all or the majority of her records were made.

**Negative pressure and nursing by calves**, V. R. SMITH and W. E. PETERSEN. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 6, pp. 431-433).—An apparatus constructed of a rubber calf nipple, rubber tubing, and a vacuum gage inserted between the teat of the cow and the tongue of the calf while suckling showed that the calf may develop a negative pressure (suction) as great as, or more often in excess of, that required in a milking machine in connection with its use on hard-milking cows. In about 30 calves, varying from 2 to 102 days in age and suckling different cows, it ranged from 12 to 18 in. Hg. One calf produced a negative pressure of 16 in. Hg on a hard milker and 10 in. Hg on an easy milker.

**Raising calves on a limited amount of milk**, O. C. CUNNINGHAM and D. H. NELSON (*New Mexico Sta. Bul.* 318 (1944), pp. 20, illus. 5).—A limited amount of whole milk was used in raising calves to 6 mo. of age. In these studies 24 heifer dairy calves were divided into 4 groups when 4 days old. The groups were arranged to compare the suitability of home-mixed calf starter when fed with either alfalfa hay or hegari fodder with an established commercial starter and with the widely accepted whole milk-skim milk method of raising calves. The experimental starter consisted largely of ground grain sorghums and cottonseed meal because both are readily available in New Mexico. Modifications of the usual dry-feed method were followed in three groups—(1) feeding no milk after 28 days of age, (2) feeding the starter twice daily, and (3) feeding the starter to 120 days of age when a simpler concentrate mixture was substituted. Two calves started on the experiment failed to make the adjustment to dry feed at 28 days of age, and 6 calves accomplished this change with difficulty. Thus a calf retarded by illness or lacking in vigor may need milk longer than 1 mo. for most satisfactory development. The Ragsdale standard for normal growth of calves (E. S. R., 71, p. 688) was exceeded by the 6 calves raised on home-mixed starter and alfalfa hay, but the average growth rate was slightly below that of calves on skim milk although above that of calves fed a commercial starter. The average cost on the dry feed was about 73 percent of that on skim milk. The poorest growth rate was made by 6 calves raised on home-mixed starter and hegari fodder, and they had the poorest general appearance, apparently due to the quality of the roughage. Analyses of the blood at monthly intervals showed no deficiency in calcium, phosphorus, vitamin A, or carotene in any of the calves. A good quality of alfalfa hay seems essential with home-mixed calf starter for normal growth.

**Sources of *Oospora lactis* on dairy farms**, E. R. GARRISON (*Missouri Sta. Res. Bul.* 388 (1945), pp. 15).—Study of the presence of *O. lactis* spores, oidia and hyphae, in barn air, on milk equipment, in feeds, silage, soil, and water, and in summer and winter cow manure showed that the concentration in the barn air depends on the kind and amount of dust present. When the animals are being brushed and cleaned, this mold is usually fairly abundant. The milk pails, strainer, and milk separators on farms producing cream were shown by wiping to commonly harbor *O. lactis*. Cistern water used for washing utensils frequently contains this mold, but carefully cleaned rubber tubes and teat cups of milking machines seldom contain it. The common feeds of the dairy farm contain *O. lactis*, but they are not rich sources of the organism. The soil or dust contaminants during milking and feeding are rich sources of this mold.

**Coliform organisms in dairy products and their control**, E. L. FOUTS and T. R. FREEMAN. (*Fla. Expt. Sta.*). (*Jour. Milk Technol.*, 8 (1945), No. 2, pp. 89-94, illus. 2).—Illustrations are given in a diagrammatic way of the two methods used to demonstrate the presence of coliform organisms in milk, cream, and certain other dairy products, (1) using a liquid medium in which gas formation indicates a positive presumptive method or (2) plating the milk on a solid differential medium in which typical colonies may be observed if positive results are obtained.

The effect of temperature on coliform organisms in milk and cream, E. D. ROBINSON and E. F. GENUNG (*Jour. Milk Technol.*, 8 (1945), No. 2, pp. 97-100).—The optimum temperature for the incubation of plates to show coliform organisms in skim milk and cream was 20° C. These organisms develop much more rapidly in cream than in milk, and some accelerating growth factor seemed to be present. An extensive bibliography is included.

Observations concerning the methylene-blue reduction test, C. K. JOHNS (*Jour. Milk Technol.*, 8 (1945), No. 2, pp. 80-84).—Because the plate count of pasteurized milk mainly determines the heat-resistant bacteria present, it is deemed doubtful whether the methylene-blue reduction test for raw milk will be of much value as an indication of the effects of pasteurization. In the reduction of methylene blue, so much effect may depend on the heat-resistant organisms present that the results become questionable. An extensive bibliography is included.

The methylene-blue reduction test as a means of estimating the bacterial content of milk, to determine its suitability for pasteurization or as a basis for grading, C. A. ABELE (*Jour. Milk Technol.*, 8 (1945), No. 2, pp. 67-79, illus. 6).

Modified Trommsdorff method as a means of selecting potentially sediment-free milk for homogenization, I. I. PETERS and G. M. TROUT. (Mich. Expt. Sta.). (*Jour. Milk Technol.*, 8 (1945), No. 1, pp. 13-18, 31).—This consists briefly in gravity creaming 1 l. of raw milk in a separator funnel, drawing off the skim milk layer, heating the cream to 70° C. to liberate the leucocytes and suspended material, and centrifuging the heated cream in a high-speed centrifuge, using a petroleum water and sediment tube. No correlation seemed to exist between the amount of sediment present in the milk or the sediment score of the milk and the intensity of sedimentation in the homogenized product. A greater intensity of sediment was found in low than in high leucocyte milk.

Methods of cream separator sanitation, C. C. TOTMAN and D. H. JACOBSEN (*South Dakota Sta. Cir.* 56 (1945), pp. 7, illus. 2).—In this study, three separators—two with stainless steel metal parts and one with tinned steel parts—were used for comparison of bacterial count, acid development, and storage quality of cream after the following treatments with different cleansing fluids: (1) Washed with hot trisodium phosphate solution, the parts then being rinsed and placed in water at 150° F. for 5 min., (2) flushed with warm water and allowed to remain at room temperature of 75°-80°, and (3) flushed with water followed by 1 gal. of the solution to be tested. Samples of cream from each separator were held at 70°, 55°, and 40° for 2, 4, and 7 days. The results indicated that the best method for securing high-quality cream is to thoroughly wash and scald the separator parts. The unwashed separator cream was uniformly of lower quality up to 3 days, but there was less difference at the end of 7 days, and frequently there was no discernible flavor difference.

More arithmetic in dairy plant operations, L. C. THOMSEN. (Univ. Wis.). (*Milk Plant Mo.*, 34 (1945), No. 4, pp. 24, 56).

Materials-balance method for determining losses of butterfat in the creamery, M. MORTENSEN (*Iowa Sta. Res. Bul.* 337 (1945), pp. 649-676, illus. 1).—In 272 churning from 24 selected creameries, in which the cream was pasteurized in coil vats, and average overrun of 22.03 percent was obtained. In 25 churning from 3 selected creameries, using a vacreator for pasteurization, the average overrun was 21.21 percent. The loss of butterfat where cream was pasteurized in a vacreator was 1.98, and where cream was pasteurized in a coil vat 1.39 percent of the total butterfat received. In the butter of the 272 churning, the average percentage of fat was 80.43, reducing the theoretical overrun 0.67 percent. The overweight allowed on the butter of 0.45 percent of the fat received reduced the overrun 0.56 percent of the theoretical. The overrun was reduced 2 percent from

the theoretical due to fat loss in the buttermilk when 26 percent cream was churned, but the reduction amounted to only 1.4 percent when 33 percent cream was churned. Because of the value of the butterfat handled in the creamery, it is important that the losses be reduced to a minimum and a definite system be employed so that daily losses may be ascertained.

The keeping quality of tinned butter, E. G. PONT (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 1, pp. 53-61).—Pronounced liability to deterioration was shown by tinned butter in hot climates. The principal defects of rancid, cheesy, and putrid flavors due to bacterial activity and objectionable physical condition consequent on melting have been controlled by the use of boric acid or by a process of vacuum working combined with salt concentrations ranging from 2.5 to 3 percent or more. Tallowy flavor due to fat oxidation still caused trouble. Raising the pasteurization temperature 15° F. or reducing the air content in vacuum processing did not affect the amount of fat oxidation in the tinned butter. Copper contamination, even in the low range of 0.06 to 0.17 p. p. m., was important, being correlated with peroxide and aldehyde values and final grades after holding 3 mo. Ethyl gallate in concentration of 0.02 percent had marked antioxidant properties in pure butterfat. Tinned butter treated with it showed a similar antioxidant effect judged by low peroxide values and the absence of pronounced tallowy characteristics, but deleterious flavors still occurred. "The essentially perishable nature of butter could not be sufficiently modified in the directions attempted to render it suitable as a tinned product for Service use."

Notes on cheese making, J. W. T. HOLLOWAY (*East African Agr. Jour.*, 10 (1945), No. 4, pp. 207-213, illus. 3).—The general principles and practices of cheese making are described, with modifications which may be made to suit any set of conditions. Special attention is given to ripening milk, and to cutting, milling, molding, and pressing the curd.

Italian cheeses—in Italy and America, R. S. BREED. (N. Y. State Expt. Sta.). (*Milk Plant Mo.*, 34 (1945), No. 4, pp. 22-23, 64, illus. 4).

Technical literature of ice cream for 1944, A. LEIGHTON. (U. S. D. A.). (*Ice Cream Rev.*, 28 (1945), No. 10, pp. 38-39, 76-84).—The usual compilation of technical papers published in 1944 (E. S. R., 91, p. 335).

Sweet potato flour as an ice cream ingredient, A. J. GELPI and P. G. KENNEDY (*Dairy Res. Digest [Louisiana Sta.]*, 3 (1945), No. 2, p. 1).—Sweetpotato flour from yellow Porto Rico types could replace as much as 3 percent of the serum solids in an ice cream mix containing 10 percent milk solids-not-fat and 10 to 12 percent fat. The finished product was of satisfactory flavor, body, and texture, with an excellent whipping quality, and the stability and melting properties were good. The use of 3 percent of potato flour lowered the percentage of sugar needed from 15 to 14 percent, and preliminary results indicate that 1 percent of sweetpotato flour can replace 0.5 percent high-test gelatin in a standard mix. This mix has excellent whipping qualities and in some cases is superior in body and texture to ice cream stabilized with gelatin.

## VETERINARY MEDICINE

Traité de protozoologie—médicale et vétérinaire [Medical and veterinary protozoology], M. NEVEU-LEMAIRE (Paris: Vigot Bros., 1943, pp. 844+, illus. 433).—This comprehensive treatise is arranged in the following parts: General protozoology; special protozoology; definitive hosts of protozoan parasites and associated organisms; and intermediate hosts, vector agents, and virus reservoirs of the protozoan parasites.

Diagnose und Bekämpfung der parasitären Krankheiten unserer Haustiere [Parasitic diseases of domestic animals], F. SCHMID (Berlin: Richard Schoets,

1944, 4. ed., rev. and enl., pp. 259+, illus. 212).—Following a discussion of animal parasites in general, this treatise takes up the parasitic diseases, in turn, of horses (pp. 66-102); ruminants (pp. 103-150); swine (pp. 151-165); carnivores (pp. 166-190); rodents (pp. 191-199); birds (pp. 200-224); gnats, horseflies, and flies (pp. 225-229); domestic animals in relation to human parasites (pp. 230-233); and diagnosis of trichinosis in man (pp. 234-235).

*Lehrbuch der Veterinär-Mikrobiologie [Textbook of veterinary microbiology]*, H. DAEMEN (Berlin: Paul Parey, 1944, 3. ed., rev., pp. 249+, illus. 63).—This treatise discusses general microbiology (pp. 1-54) and special microbiology (pp. 55-243). The latter section considers the specific diseases associated with the various micro-organisms.

Some aspects of British wartime veterinary research, G. LAPAGE (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 817, pp. 204-210).—Wartime developments are discussed in veterinary education and research, artificial insemination, animal genetics, animal diseases, veterinary-medical collaboration, and international aid.

[Miscellaneous contributions] (*Amer. Jour. Vet. Res.*, 6 (1945), No. 19, pp. 81-83, 103-106, 117-119, illus. 4).—These contributions include Granulosa Cell Tumor of a Bovine Ovary, a description by R. F. Langham and C. F. Clark (pp. 81-83) (Mich. Expt. Sta.); The Immunizing Action of a Lymphoid Tumor in Chickens, in which chickens which had received viable implants of a transmissible lymphoid tumor exhibited a marked resistance to subsequent inoculation with the same tumor, by C. Olson, Jr. (pp. 103-106) (Mass. Expt. Sta.); and *Saccharomyces guttulatus*—I, Pathogenicity for Young Rabbits, suggesting that *S. guttulatus* will slow up the normal growth of rabbits and may be a contributory factor in mucoid enteritis, by T. J. Hage (pp. 117-119).

Some practical applications of immunological principles, M. BARR and A. T. GLENNY (*Jour. Hyg. [London]*, 44 (1945), No. 2, pp. 135-142, illus. 5).—Data are assembled and discussed from which the authors conclude that "general immunological principles appear to be of wide if not universal application and can be applied equally to the hyperimmunization of horses for the production of therapeutic sera or to human immunization against diphtheria and tetanus. A wider knowledge of the results obtained in animals, chiefly guinea pigs, rabbits, and horses, can help in a better understanding of all that is involved in the immunization of children against diphtheria.

"The response of an animal to an antigenic stimulus depends almost entirely on its previous experience of that antigen. If it has had no previous experience, antibody is produced slowly and in small amounts. If it has had previous experience, a change occurs in its antibody-producing mechanism which enables it on further stimulation to produce antibody more rapidly and in larger amounts. To produce this effect the early experience must be adequate and followed by a sufficient period of rest. It is shown that the normal antitoxic values of animals can give considerable information on their previous experience of antigen; that this information can be made use of in the hyperimmunization of horses; and that inadequate primary stimuli and failure to provide adequate rest may lead to the production of antitoxins of low value and poor quality.

"Two things are necessary for defense against toxins—circulating antitoxin and a high reactivity of the antibody-producing mechanism (potential immunity). Methods of immunization should be chosen so as to provide both these essentials."

Hormonal therapy in relation to veterinary practice, R. P. REECE. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 817, pp. 191-200).—This extension of a paper presented at the 1944 meeting of the American Veterinary Medical Association discusses hormonal therapy in cattle, sheep, goats, and mares, as well as general considerations. A list of 55 references is appended.

Recent advances in the study of antibacterial substances produced by micro-organisms, M. A. SOLTYS (*Vet. Rec.*, 56 (1944), No. 26, pp. 219-220).—This review takes up in turn the antibiotic substances produced by bacteria, actinomycetes, and molds, including a tabulation as to organisms affected and the toxicity.

Phenothiazine in veterinary practice, M. A. STEWART. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 817, pp. 217-222).—This is a review, with 38 references, of the advantages, disadvantages, and contraindications of phenothiazine in veterinary practice.

Penicillin: Brochure with annotated bibliography, 1945 (*Rahway, N. J.: Merck & Co.*, 1945, pp. 191+, illus. 11).—This review of present knowledge deals with the history, standardization and production, activity in vitro and in vivo, pharmacology, and clinical usage of penicillin, its uses in veterinary medicine, and methods of assay. The annotated bibliography contains 521 items published through July 1944.

Penicillin—A review, W. VAN WINKLE, Jr. and R. P. HERWICK (*Jour. Amer. Pharm. Assoc., Sci. Ed.*, 34 (1945), No. 4, pp. 97-109).—From this review (106 references) the authors conclude that "in penicillin we have a potent antibacterial agent which is free from major toxicity and effective against a wide variety of pyogenic cocci and gram-positive bacilli."

The stability of penicillin sodium held at various temperatures, W. A. RANDALL, H. WELCH, and A. C. HUNTER (*Jour. Amer. Pharm. Assoc., Sci. Ed.*, 34 (1945), No. 4, pp. 110-113, illus. 2).—Studies are reported from which the authors conclude that "penicillin sodium is a relatively stable product when it is kept below 10° C., and when properly prepared will maintain its potency for at least 1 yr. under such temperature conditions. Even at higher temperatures short periods of exposure should have no deleterious effect on the potency."

Sulphonamides in general veterinary practice (*Vet. Rec.*, 57 (1945), Nos. 20, pp. 229-233; 21, pp. 245-248).—This is a discussion of the experimental basis of sulphonamide therapy, opened by G. Brownlee, and included data reported by him on the relative efficiency of sulphanilyl drugs against strains of *Escherichia coli* from fatal cases of white scours in calves and the influence of the media on the resistance of *Streptococcus agalactiae* to the sulfa drugs and penicillin.

Experiments to ascertain the effect of certain chemical solutions on anthrax spores, J. K. H. WILDE (*Vet. Jour.*, 101 (1945), No. 3, pp. 64-65).—Experiments to find an agent which could be used economically in Tanganyika Territory for the disinfection of hides against anthrax showed the best results with 5 percent formalin solution and 5 percent sodium nitrite solution plus a trace of acetic acid, but none of the substances tested are recommended for general use.

Studies on the nature and properties of the perienteric fluid of *Ascaris lumbricoides*, W. P. ROGERS (*Parasitology*, 36 (1945), Nos. 3-4, pp. 211-217, illus. 13).—The composition of the perienteric fluid of *A. lumbricoides* was determined, both immediately after removal from the host (pig) and after varying periods of in vitro starvation. The chief factors (such as starvation, osmotic pressure, and the nature of the medium) affecting its composition are briefly discussed.

A clinical study of Venezuelan virus equine encephalomyelitis in Trinidad, B. W. I., R. T. GILYARD (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 818, pp. 267-277, illus. 3).—The historical background for the recognition of this third primary equine neurotropic virus is discussed in this preliminary report, including the Trinidad outbreak of 1943. Other phases include reservoirs of the virus in nature, the epitheliotropic hypothesis, vaccinal activation of incubative infection, and the human pathogenicity of Venezuelan virus. Because of the failure of vaccine of eastern and western origin to protect against this form, "typing the virus in each outbreak becomes increasingly essential to the continued success of vaccination."

The morphology of *Bacterium tularensis*, W. HESSELBROCK and L. FOSHAY (*Jour. Bact.*, 49 (1945), No. 3, pp. 209-231, illus. 77).—As a result of these morphological studies, the authors recommend the invalidation of the terms *Pasteurella tularensis*, *Brucella tularensis*, and *Coccobacterium tularensis*, retaining *Bacterium tularensis* as the most suitable temporary designation.

Ergotism in pregnant sows, female rats, and guinea pigs, A. W. NORDSKOG and R. T. CLARK. (Mont. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 19, pp. 107-116, illus. 2).—An experiment was conducted to determine the effect of ergot on reproduction and lactation in swine. In addition, two supplementary experiments were made, using pregnant guinea pigs and pregnant rats.

Nine sows fed 0.5 or 1.0 percent barley ergot farrowed 83 pigs averaging 1.8 lb. at birth. Of these, 38 were born alive but died shortly after birth. These sows showed almost complete lack of udder development, and no evidence of milk secretion was observed. Twelve control sows on regular feed produced 106 pigs averaging 2.9 lb. at birth, and of these only 3 were born dead. All these sows showed normal udder development and milk secretion. Three sows, fed ergot in varying concentrations during the early part of pregnancy but changed to regular feed from 11 to 45 days previous to farrowing, showed definite udder development and milk secretion at farrowing time.

When female rats were fed varying concentrations of barley ergot during pregnancy, no young were produced by any of those fed ergot during the first 12 days or more of the experiment, and others fed ergot later produced young living only 3 to 7 days. In general, the results with guinea pigs similarly fed with barley and rye ergot were negative.

Toxicity trials with the insecticide "666" on rabbits, sheep, and a bovine, H. S. PURCHASE (*Vet. Rec.*, 57 (1945), No. 18, p. 211).—Tests were carried on in Kenya in which two rabbits drenched with "666" remained healthy after injecting 2.7 and 2.34 gm., respectively in 3 days. Two others receiving 60 gm. died of broncho-pneumonia. Two sheep receiving 0.5 gm. per kilogram of live weight daily for 3 days remained healthy, as did also two sheep receiving double and two sheep receiving quadruple this amount. An 18-mo. bull weighing 274 kg. was given a single drench of 822 gm. and aside from nausea for 36 hr. remained normal. It was concluded that "666" is not toxic for domesticated animals in the quantities used, and that a sheep could eat from 3 to 5 kg. and cattle 16 to 27 kg. of poisoned locust bait containing from 3 to 5 percent of "666" without harm. One of six assistants in the drenching was affected with a transient irritation of the skin with which the compound came in contact.

On variation in the blood cells of healthy cattle, L. C. FERGUSON, M. R. IRWIN, and B. A. BRACHT. (Wis. Expt. Sta. coop. U. S. D. A.). (*Jour. Infect. Diseases*, 76 (1945), No. 1, pp. 24-30).—Observations were made on the blood picture of 19 cows at weekly intervals over a period of about 2.5 yr., and on that of 6 others for a lesser period of time. The means or averages of the various cellular constituents and their respective standard errors are as follows: Red blood cells,  $6,322,910 \pm 17.78$  per cubic millimeter; white blood cells,  $8,911.52 \pm 42.37$  per cubic millimeter; polymorphonuclears,  $34.73 \pm 0.17$  percent; monocytes,  $7.94 \pm 0.07$  percent; lymphocytes,  $41.24 \pm 0.16$  percent; eosinophiles,  $14.87 \pm 0.14$  percent; and basophiles  $0.62 \pm 0.02$  percent. The considerable fluctuation in the data is indicated by the relatively large standard deviations of each of the classes. A statistical analysis of the data, using the methods of analysis of variance, showed that there was much more variation in the blood picture between animals than in the weekly counts within animals. That is, much of the variation was due to differences in the blood picture between individuals.

Some observations on bovine neoplasia, J. E. KENNY (*Vet. Rec.*, 56 (1947), No. 9, pp. 69-71, illus. 12).—Data derived from the examination of 214 neoplasms

encountered in 1932-40 in the slaughter of 21,592 bovines in Eire under the Bovine Tuberculosis Order are presented. Brief comments are included as to malignancy and differential diagnosis.

**Granulomatous lesions in cattle in Kenya resembling those of actinobacilosis.** D. SLAVIN (*Vet. Rec.*, 56 (1944), No. 4, pp. 25-26).—A condition resembling actinobacillosis which affected three cattle in Kenya is described. The strains isolated differed from *Actinobacillus lignieresii* in important particulars.

**Results of bacteriological examination of aborted bovine fetuses from brucellosis-free herds.** L. E. JOHNSON and R. GRAHAM. (Univ. Ill.). (*Cornell Vet.*, 35 (1945), No. 1, pp. 36-40).—Three bovine fetuses originating from two separate brucellosis-free herds where sporadic abortion occurred were examined. From the first fetus *Salmonella cholerae-suis kunsendorf* was isolated; from the second, *Erysipelothrix rhusiopathiae*; and from the third, *Corynebacterium pyogenes*. A pregnant heifer inoculated intravenously with a 5-cc. saline suspension of *S. cholerae-suis kunsendorf* aborted in 16 days, and the organism was recovered from the internal organs of the fetus. Three heifers in the seventh month of gestation were inoculated intravenously with a 5-cc. culture of *E. rhusiopathiae*. These heifers did not abort but continued to full term, when two gave birth to normal young; the third gave birth to a dead calf. From the stomach of the still-born calf, *E. rhusiopathiae* was recovered. Cultures from the heart blood, liver, spleen, kidneys, and lymph glands of this calf proved negative to *E. rhusiopathiae*. A pregnant heifer in the fourth month of gestation was inoculated intravenously with a 5-cc. saline suspension of *C. pyogenes*. Fourteen days later the heifer aborted an immature fetus from which *C. pyogenes* was recovered.

**Variations in the blood picture of cattle following an induced infection with *Brucella abortus*.** L. C. FERGUSON, M. R. IRWIN, and B. A. BEACH. (Wis. Expt. Sta. coop. U. S. D. A.). (*Jour. Infect. Diseases*, 76 (1945), No. 1, pp. 31-39).—Using 21 of the 25 cows of the study noted on page 495, changes in the number of red and white blood cells and in the proportions of the different types of leucocytes were noted in the same animals, before and following artificial infection with *B. abortus*. The following significant effects were presumably produced by the infection: The total number of erythrocytes and leucocytes per cubic millimeter decreased following the infection. Of the different types of leucocytes, the mean percentage of polymorphonuclear cells, monocytes, and basophiles increased, while that of the lymphocytes and eosinophiles decreased after the infection.

When the animals were classified as to whether they were resistant or susceptible to infection with *B. abortus*, the mean total number of red blood cells per cubic millimeter was higher in the susceptible than in the resistant animals in the pre-infection period. The susceptible animals had a significantly higher average number of leucocytes per cubic millimeter both preceding and following infection. The percentages of polymorphonuclears and monocytes were slightly higher in the resistant animals, in both the preinfection and postinfection periods. The proportions of lymphocytes and eosinophiles were greater in the susceptible animals, both before and after infection with *B. abortus*.

The observations in the postinfection period were further divided into (1) those made before, and (2) those made following calving or abortion. The average number of leucocytes increased in the postparturient period over that observed before parturition, and the mean percentage of monocytes likewise was slightly higher after parturition than before. The other types of cells showed no statistically significant changes prior to and after calving or abortion.

**Disease of Oregon cattle associated with hypomagnesemia and hypocalcemia.** O. H. MUTH and J. R. HAAG. (Oreg. Expt. Sta.). (*North Amer. Vet.*, 26 (1945), No. 4, pp. 216-219).—A disorder encountered among cattle pastured during the winter months on an island of 1,700 acres in the Columbia River, about 27 miles

from the Pacific Ocean, is described. Losses were confined to mature cows up to 10 yr. of age which had recently calved or were about to calve, but continued among animals, mostly pregnant, when moved to a pasture on the mainland 25 miles distant. The clinical picture, especially in the moribund state, was similar to that observed in the last stages of milk fever, but in animals observed soon after the onset of symptoms there was noted a marked hyperexcitability. The cause of the disease was not ascertained, but blood samples indicated a condition associated with hypomagnesemia and hypocalcemia. Analysis of feedstuffs, including pasture samples, failed to show any deficiency in either their magnesium or calcium content, precluding the assumption that this is a "deficiency disease in the ordinary sense."

**Bovine mastitis.** R. A. HENDERSHOTT (*Vet. Med.*, 40 (1945), No. 6, pp. 191-197, illus. 5).—This address reviews the status of research and describes the New Jersey plan for mastitis control.

**The problems of bovine mastitis.** J. FRANCIS and J. S. STEWARD (*Vet. Rec.*, 56 (1944), No. 45, pp. 421-425).—This discussion deals especially with methods of diagnosis and control.

**The examination of milk samples for mastitis:** The comparative value of deep blood plating and incubated smears in diagnosis, H. I. FIELD and H. W. SMITH (*Vet. Rec.*, 56 (1944), No. 45, pp. 425-426).—In an examination of 1,080 samples by both the deep blood plating and incubated smear methods, *Streptococcus agalactiae* was found present in 260 samples by one or both methods. Complete agreement was reached in 193 samples, while 28 were positive only by deep blood plating and 39 positive only by the inoculated smears. The latter method is deemed suitable for the early recognition of *S. agalactiae* infection.

**The reliability of indirect field tests for the diagnosis of chronic contagious mastitis.** R. W. ROACH (*Vet. Rec.*, 56 (1944), No. 46, pp. 433-436).—From comparisons of various indirect field and laboratory tests it is concluded that a combination of bromocresol-purple, strip cup, and manual examination reveals a high percentage of the infected animals, but incriminates a large number which are not infected and fails to detect some heavily infected animals. An urgent need is seen for "an accurate, yet simple, laboratory test for the diagnosis of mastitis milk".

**Studies on bovine mastitis.—II, A note on the presence of streptococci, especially Str. agalactiae, in milk from beef cows** (*Austral. Vet. Jour.*, 21 (1945), No. 1 pp. 12-14).—The initial part of this series<sup>6</sup> having shown that the infected udder is not the only reservoir of *S. agalactiae*, studies were made in which milk samples were taken from individual quarters of 58 beef cows (primiparae) on one to seven occasions within the first 3.5 months of calving. A total of 895 samples were examined bacteriologically. Of these 79 from 64 quarters of 37 cows yielded streptococci, but pure cultures became available from only 56 samples of 49 quarters of 31 cows. Nongroup B streptococci only were present in 45 samples from 40 quarters of 27 cows. *S. agalactiae*, either alone or mixed with other streptococci, was found in 10 samples from 10 quarters of 7 cows. One aberrant or doubtful strain of *S. agalactiae* was recovered from 1 quarter of 1 cow. One quarter of 1 cow appeared to have an appreciable micrococcal infection. All the udders were clinically normal.

**The relationship of teat mucous membrane topography to age, breed, and incidence of udder infection in cows,** J. M. MURPHY. (N. J. Expt. Stas.). (*Cornell Vet.*, 35 (1945), No. 1, pp. 41-47, illus. 3).—Observations made following those of Johnston (E. S. R., 80, p. 105) are reported to determine a possible relationship between the topography of the teat mucous membrane and the incidence of udder infection. In this study, the gross anatomical features of the lining mucous membrane of the teats of 21 cows (11 Guernsey and 10 Holstein) were compared

<sup>6</sup> Studies on Bovine Mastitis.—I, Study of an Experimental Herd (*Austral. Council Sci. and Indus. Bul.* 134 (1940), pp. 107+, about 23 illus.).

with the accumulated history of udder infection for 41 lactation periods. It was found that teat mucous membrane topography, as based on the most outstanding characteristic, the pocket or pouch, was (1) a characteristic of the individual and of the breed, (2) not related to the age of the individual at the time of death, and (3) not a major factor in the natural establishment of udder infection.

**Pattern of fluctuations in numbers of *Trichomonas foetus* occurring in the bovine vagina during initial infections, I, II.** (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 19, pp. 84-95).

**I. Correlation with time of exposure and with subsequent estrual cycles,** D. M. Hammond and D. E. Bartlett (pp. 84-90).—Detailed observations are presented on initial infections with *T. foetus*, induced by coitus with infected bulls, and a hypothesis to explain the periodic fluctuations in numbers of *Trichomonas* in typical initial infections.

*Trichomonas* first appeared in the vaginal samples 6 to 11 (average = 8.3) days following the coitus which initiated the infection. The samples from all the females contained appreciable numbers of organisms from the twelfth to the nineteenth days following coitus. Following the period of high counts, there was a marked decrease in numbers of *Trichomonas*; this occurred approximately 3 weeks after exposure. During the remainder of the infection, there was a characteristic pattern of appearance and disappearance of *Trichomonas* in the vaginal samples. Several days (3 to 7 in the majority of instances) before estrus, large numbers of *Trichomonas* appeared suddenly, while at or immediately after estrus the samples became negative and remained so until the approach of the next estrus. The patent period of the infection continued through from two to four (average = 3.1) estrual cycles subsequent to the first return to estrus. The last positive samples were obtained from 72 to 126 (average = 92) days following the service which resulted in infection.

**II. Application in diagnosis,** D. E. Bartlett and D. M. Hammond (pp. 91-95).—Studies of the data obtained above led to the conclusion that the best females to select for purposes of diagnosis are known susceptible (virgins) that have recently been bred to a bull suspected of being infected. It is recommended that examination of such females should be made either (1) 12 to 19 days post coitus or, as a second choice, if early return to estrus occurs, (2) a few days preceding any of the anticipated subsequent two or three estrus.

**A note on the appearance of serological varieties among *T. foetus* strains isolated from infected cattle,** W. R. KERR and M. ROBERTSON (*Vet. Rec.*, 19 (1945), No. 57, pp. 221-222).—Although up to 1943-44 all strains of *Trichomonas foetus* examined by the authors had shown the same serological reactions, two strains received subsequently have proved to be aberrant as regards agglutinability. It is pointed out that the nature of the antigen cannot be deduced merely from the failure to agglutinate, and that the effectiveness of the skin test as a means of diagnosis for trichomoniasis in the field needs to be reconsidered in relation to the degree of variation in the antigens of the infecting strains.

**Lesser known lesions of diagnostic value in bovine trypanosomiasis,** F. C. WADDINGTON (*Vet. Rec.*, 56 (1944), No. 1, pp. 2-3).—The value, as aids to clinical diagnosis and prognosis, of the tongue and tail lesions observed in chronic bovine trypanosomiasis due to *Trypanosoma congolense* and *T. vivax* is discussed. Details of 10 specimen cases are given.

**Studies on the complement fixation reaction as applied to bovine tuberculosis,** R. B. JOHNSON. (Cornell Univ.). (*Cornell Vet.*, 35 (1945), No. 1, pp. 52-60).—Using a technic similar to that of E. Witebsky et al.,<sup>4</sup> sera from a total of 432 tuberculin reactor cattle and 832 normal animals were tested with the Witebsky antigen. A

<sup>4</sup> Zentral. Bakt. [etc.], 1. Abt., Orig., 123 (1931), No. 1-3, pp. 65-67.

total of 70.9 percent of the tuberculous animals, 74.6 percent of those with skin lesions, 50.5 percent of those with no visible lesions, and about 7 percent of the normal animals gave a positive complement fixation test. All of the cases of generalized tuberculosis reacted strongly, 56.2 percent of those animals exhibiting lesions in the lungs reacted positively, and 70.2 percent of those showing localized lesions in lymph glands gave a positive test. Monthly tests were also carried out on a herd of 70 to 75 animals which were supposedly all free from tuberculosis. A total of 19 of these animals gave a positive test at one time or another during the testing period. It was found that certain of the animals reacted transiently to the test for a period of only 2 or 3 mo. Other animals, however, appeared to be more permanently sensitized.

**Poisoning of cattle through the use of nicotine and lime dressing for warbles,** R. E. MCGRATH and D. CAMPBELL (*Vet. Rec.*, 56 (1944), No. 8, pp. 64-65).—The death within 2 hr. of 3 out of 24 cattle receiving a dressing over the back with a mixture of slaked lime and about 2 oz. of nicotine sulfate per gallon of water is noted. All of the fatal cases had warble swellings, and it is thought that these were the chief avenue of absorption. Some absorption through the unbroken skin is thought to have occurred, however, and it is suggested that the risk of nicotine dressings would be lessened by confining them as closely as possible to the warble hole.

**The primary screw-worm fly, Cochliomyia americana C. and P., as a vector of joint ill in calves,** M. W. EMMEL. (*Fla. Expt. Sta.*). (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 817, pp. 223-224, illus. 2).—Noted from Florida Experiment Station Bulletin 407 (E. S. R., 92, p. 838).

**Intubation of the abomasum in sheep,** R. H. WATSON and I. G. JARRETT (*Austral. Vet. Jour.*, 21 (1945), No. 1, pp. 8-11, illus. 2).—A technic is described by the use of which stomach tubes have been successfully introduced into the abomasum in sheep via the nose and esophagus. The potentialities and limitations of this technic are discussed.

**Photosensitization or "bighead" in sheep in Vermont,** J. E. SAWYER (*Cornell Vet.*, 35 (1945), No. 1, p. 65).—About 13 in a flock of 200 sheep moved to a pasture at the foot of a large mountain in Vermont suddenly developed extreme swelling of the entire head, including the ears, eyelids, nose, mouth, and under the throat, with a copious yellow discharge from the nostrils. Only sheep with white faces were affected. On removal of the sheep from the pasture, the swellings gradually receded and after 2 weeks the sheep appeared normal. The author diagnosed the attack as a photosensitization due to grazing on a weedy mountain pasture.

**Chronic endemic dental fluorosis in sheep,** H. R. SEDDON (*Austral. Vet. Jour.*, 21 (1945), No. 1, pp. 2-8, about 5 illus.; abs. in *Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 820, pp. 26-27, illus. 3).—Observations are reported on a number of sheep from 3 to 6 yr. old which had access to water containing 12 and 19 p. p. m. of fluorine. Dental lesions were noted identical in all respects with those recognized as being due to fluorosis.

**Phenothiazine as an anthelmintic for breeding ewes,** W. T. S. THORP, W. L. HENNING, and J. F. SHIGLEY. (*Pa. Expt. Sta.*). (*Jour. Anim. Sci.*, 4 (1945), No. 2, pp. 133-140, illus. 2).—The authors continued earlier work (E. S. R., 92, p. 115), using three main groups of sheep: (1) Twenty Merino ewes receiving a 1 : 9 phenothiazine and salt mixture for 3 yr.; (2) the lambs produced by these ewes; and (3) four farm flocks of ewes of varied breeding and maintained under practical farm conditions. The lambing percentage was not affected by the continuous administration of the mixture, and it is recommended as an anthelmintic for breeding ewes. No indication of toxicity was observed when it was administered in this form to sheep during the grazing season only, but its use during the winter

is not recommended for northern areas. Continuous administration may leave enough residual infestation to produce a mild infestation in the lambs (which will not consume much of the mixture), and it is therefore deemed important that the fall and spring drench previously recommended be kept in the program.

Using chemicals in combating internal parasites of sheep, D. F. EVELETH and A. I. GOLDSBY (*North Dakota Sta. Bim. Bul.*, 7 (1945), No. 4, pp. 9-11).—This article summarizes some of the methods that have been found effective in ridding sheep of the various types of worms and other internal parasites.

Early and late treatment of market lambs for gastro-intestinal parasites, J. H. RIETZ and C. V. WILSON (*West Virginia Sta. Cir.* 80 (1945), pp. [4]).—Trials involving 216 lambs marketed during 1936-45 indicated little or no effect on gains, grade, or dressed yield of the 108 treated with either 1.5 percent copper sulfate solution or its mixture with 1.5 percent nicotine sulfate for control of stomach and intestinal parasites when given prior to weaning. Slightly better growth and gains were obtained with lambs untreated up to the time of going to feedlots. The two solutions were equally effective in removing tapeworms, but an accompanying note states that work with phenothiazine in progress at the station for nearly 2 yr. indicated that it is superior to either.

Absorption and excretion of sulfaquinoxaline in a ruminant, H. S. CAMERON and W. A. McOMIE. (Univ. Calif.). (*Cornell Vet.*, 35 (1945), No. 1, pp. 47-51). Experiments to correlate dosage and blood levels of 2-sulfanilyl aminoquinoxaline (sulfaquinoxaline) in sheep are reported. Seven healthy lambs and yearlings, weighing 70 to 110 lb. and fed on well-cured alfalfa hay, were used. Except in two instances, where large amounts were given by drench, the drug was administered in gelatin capsules. The investigations suggest that sulfaquinoxaline, if proved effective from the standpoint of therapy, can be used in veterinary medicine. "While the drug has the advantage of being slowly excreted, it has the consequent disadvantage of being more toxic than those rapidly excreted. The dose, therefore, must be critical. Judging from the experimental results, the maximum amount that can be safely administered to sheep is 400 mg. per kilogram or, transposed to an approximate equivalent, 3.5 gm. per 20 lb. body weight, given in a single dose."

Experimental reproduction of so-called enterotoxemia, J. W. BRITTON and H. S. CAMERON. (Univ. Calif.). (*Cornell Vet.*, 35 (1945), No. 1, pp. 1-8).—The authors report experiments with lambs which are deemed to support the claim that so-called enterotoxemia is a form of acute indigestion resulting from primary intestinal atony. No evidence was found to indicate that the type D toxin of *Clostridium welchii* which was employed is absorbed from an isolated loop of jejunum.

A clinical and laboratory study of spontaneous listerellosis in a goat, M. M. KAPLAN and A. E. LAGER (*Vet. Med.*, 40 (1945), No. 6, pp. 199-202, illus. 2).—A case said to have been the first reported from Massachusetts is described.

La vacuna al cristal violeta para la prevención del cólera porcino en Venezuela [Vaccination with crystal violet for the prevention of hog cholera in Venezuela], R. NOVICKY (*Bol. Inst. Invest. Vet. [Venezuela]*, 2 (1944), No. 8, pp. 255-291+, Eng. abs., pp. 289-291; *Caracas, Venezuela: Lit. y Tip. Vargas*, 1945, pp. 41+, Eng. abs., pp. 39-41).—Several experiments with vaccines prepared with both the Venezuelan and United States viruses were carried out, 90 pigs being used. Vaccines prepared with either strain were found to be innocuous for pigs, but doses of 10 or 15 cc. of the United States strain protected approximately 95 percent against the artificial infection caused by the inoculation of 1 cc. of virus as compared with approximately 85 percent with the Venezuelan vaccine. Pigs which did not absorb the vaccine well and developed swellings at the point of injection did not become immune. As regards immunization with 10 or 15 cc. of the vaccine, the degree of the protection was in direct relation to the size of the dose.

The antibody response of swine to vaccination with inactivated swine influenza virus, I. W. MCLEAN, JR., D. BEARD, A. R. TAYLOR, D. G. SHARP, and J. W. BEVAN (*Science*, 101 (1945), No. 2630, pp. 544-546).—Several series of tests are reported, from which it is concluded that "the findings reveal an efficiency of repeated small doses of vaccine in swine far greater and longer-lived than that of a single large dose, and a considerable dependence of the degree of effect on the length of the interval between vaccinations. Formalin and ultraviolet vaccines behaved alike, and adsorption on alum did not greatly enhance the titer or prolong the antibody level."

Equine infectious anaemia: An outbreak in the Ottawa Valley, C. A. MITCHELL, F. A. HUMPHREYS, and R. V. L. WALKER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 8 (1944), Nos. 6, pp. 165-178, illus. 6; 7, pp. 196-201, illus. 4).—An account is given of three outbreaks. For the first, observations beginning in July 1931 are tabulated for 14 cases, of which 11 terminated fatally. The virus involved was found to be similar to that found in western Canada, but cross immunization experiments indicated some minor differences. Attempts to produce immunity with tissue vaccine were unsuccessful.

The rôle of nutrition in equine periodic ophthalmia, T. C. JONES, F. D. MAURER, and T. O. ROBY (*Amer. Jour. Vet. Res.*, 6 (1945), No. 19, pp. 67-80, illus. 16).—Although an earlier report (E. S. R., 87, p. 117) indicated no major role for nutrition in this disease, a detailed comparison has revealed striking similarities between the lesions of equine periodic ophthalmia and those observed in riboflavin deficiency in experimental animals. Corneal vascularization, iridocyclitis, and cataracts were common lesions encountered. The similarity of these lesions has suggested a common etiology. The B complex vitamin content of equine feedstuffs was determined and possible deficiencies discussed. The role of ascorbic acid in the ocular structures was considered.

Analysis of equine tissues revealed a severe decrease of ascorbic acid in the ocular fluids in periodic ophthalmia. The most severe decrease occurred during the acute stage but persisted in a lesser degree during the quiescent stage. The depletion of ocular ascorbic acid was associated with increased intraocular vascular permeability, which can be demonstrated by means of a fluorescein test. "It is suggested that a lack of certain dietary essentials (notably riboflavin) may influence the synthesis of ocular ascorbic acid, or its protecting substances. This in turn may produce the lesions of periodic ophthalmia."

Spergon—fungicide for summer eczema in dogs, R. D. HATCH. (Va. A. and M. Col.). (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 818, p. 278).—This product was tested in pure form and mixed with either boric acid or starch in equal proportions. Application was usually by dusting and rubbing into and around clipped areas. All of 15 cases of moist eczema were definitely benefited in from 1 to 72 hr. Results in diffuse dry cases were less promising. No symptoms of toxicity were noted.

Control of leptospirosis in war dogs, T. C. JONES, T. O. ROBY, C. L. DAVIS, and F. D. MAURER (*Amer. Jour. Vet. Res.*, 6 (1945), No. 19, pp. 120-128, illus. 7).—A plan for the control of this disease in war dogs is outlined, based on the early detection of shedders and their prompt elimination. The plate agglutination test was used exclusively, and is deemed highly specific although less sensitive than the microscopic agglutination and agglutination-lysis test. Out of 4,368 dogs tested, 58 were positive. Autopsy examination of 48 dogs which reacted positively but were outwardly normal revealed characteristic kidney lesions.

Histologic diagnosis of rabies, E. HERZOG (*Arch. Pathol.*, 39 (1945), No. 4, pp. 279-280, illus. 2).—A method is briefly described which consists of a rapid staining of frozen sections from different planes of the ganglion nodosum of each

side of the vagus nerve with cresyl violet. It is claimed that the method permits the making of a diagnosis in less than 1 hr.

Rabies in wild foxes, L. S. COMPTON (*Cornell Vet.*, 35 (1945), No. 1, pp. 68-72).—An outbreak in Chautauqua County, N. Y., is discussed, including procedures adopted to prevent its spread to dogs.

A study of infectious bronchitis in chickens, I-III, M. S. HOFSTAD. (*Cornell Univ.*) (*Cornell Vet.*, 35 (1945), No. 1, pp. 22-31, illus. 6; pp. 32-35, 60-61).

I. *The pathology of infectious bronchitis*.—A study of the pathology in experimental and field cases of infectious bronchitis was made. No pathognomonic lesions could be ascribed to the disease. The outstanding pathological lesion was the thickening of the tracheal mucous membrane and submucosa due primarily to edema and diffuse, leucocytic infiltration. There appeared to be little disturbance in the continuity of the epithelium despite the edema and cellular infiltration. The lumen of the trachea remained free from cells for the most part in experimental cases, although, in field cases, exudate containing leucocytic cells was commonly seen. There was complete absence of gross hemorrhage. Little apparent desquamation of epithelium occurred from the tracheal and bronchial mucosa. Only in field outbreaks of chicks under 2 or 3 weeks of age, were gross lesions seen in the nasal passages, sinuses, and air sacs. Inclusion bodies were not observed. Significant changes were not seen in sections of liver, spleen, and kidney.

II. *Observations on the carrier status of chickens recovered from infectious bronchitis*.—Experiments were conducted in an attempt to demonstrate carrier birds among chickens that had recovered from infectious bronchitis. In one trial the recovered birds had been inoculated experimentally. In three trials birds recovered from field outbreaks were used. One trial had birds that had recovered from both the experimental and natural disease. The time interval after recovery ranged from 3 weeks to 4 mo. The trials were carried out by placing susceptible and the recovered birds in direct contact for 3 weeks or longer. By the method used, it was not possible to demonstrate the existence of carriers of infectious bronchitis virus among the recovered birds used in the experiment.

III. *Attempts to utilize the chicken red cell agglutination test as a diagnostic aid in infectious bronchitis*.—In extension of the work of Lush (E. S. R., 89, p. 592) with the Hirst test and modifications, trials were carried on in which no agglutination occurred, and the test was indicated as "of no value for the diagnosis of infectious bronchitis."

## AGRICULTURAL ENGINEERING

Federal-State cooperative snow surveys and irrigation water forecasts [as of February 1 and March 1, 1945]. (*Coop. Colo. Expt. Sta. et al.*, U. S. Dept. Agr., *Soil Conserv. Serv.*, 1945 [*Colo. River*], Feb., pp. 7+, illus. 2; Mar., pp. 7+, illus. 2; [*Mo. and Ark.*] Feb., pp. 13+, illus. 2; Mar., pp. 1+, illus. 2; [*Rio Grande*] Feb., pp. 4+, illus. 2; Mar., pp. 5+, illus. 2).—Results of surveys for each month for the Colorado River, Missouri and Arkansas, and Rio Grande drainage basins, respectively, are given.

Nevada cooperative snow surveys, H. P. BOARDMAN ET AL. (Nev. Expt. Sta., U. S. D. A., et al.). (*Nev. Coop. Snow Surveys*, 1945, pt. 1, Apr., pp. [4]).—A continuation of previous studies (E. S. R., 92, p. 274).

Federal-State cooperative snow surveys and irrigation water forecasts for Oregon, May 1, 1945.—Supplemental report. (*Coop. Oreg. Expt. Sta.*). (U. S. Dept. Agr., *Soil Conserv. Serv.*, 1945, May, pp. 5).

Irrigation wells and well-drilling methods in California, C. N. JOHNSTON (*California Sta. Cir.* 361 (1945), pp. 37, illus. 28).—The information brought together in this circular is not intended as a manual for well-drillers, but is offered to

acquaint farmers with the operations involved. In addition, well characteristics are considered so as to aid irrigators in understanding the behavior of their wells. The information furnished should enable the prospective well owner to select from such methods as are locally available that which best meets his needs.

The topics taken up include sources and distribution of underground water, drilling methods in California, well logs, straightness of hole, well casing or lining, well development, depth-to-water measurements, use of well drawdown in selecting a pump, and the well-drilling agreement.

**Choose your drain tile to fit your soil,** D. G. MILLER (*Minn. Farm and Home Sci. [Minnesota Sta.], 2 (1945), No. 3, pp. 6-8, illus. 2*).—The author reports application of the A. S. T. M. freezing and thawing test, with the results (1) that of 1,140 pieces (from 26 plants) which passed the extra-quality requirements, 83 percent also passed the test of double that requirement; and (2) that the percentage of water tiles will absorb is a rough index of their frost resistance (a fact important mainly because the absorption test can be made much more quickly and easily than the freezing-and-thawing test). Percentages of water absorption shown by the products from 22 Minnesota and Iowa plants are tabulated.

Concrete tiles, though not subject to much front damage, are stated to be best made from "type V" cement or from the standard portland cements made at two points in Iowa where the standard product has a high sulfate resistance. The improved resistance to saline substances in the soil which can be brought about by steam curing is also noted. Tests of nearly 9,000 2- by 4-in. cylinders, exposed in peat for periods upward to 20 yr. at six locations, and in mineral soil at two locations, showed that the degree of peat acidity is a fair indicator of the degree of the corrosive action on concrete. Practically all concrete specimens so far examined have shown some evidence of deterioration in all the peats where the exposure periods have been around 20 yr., and it is doubted that it is good practice to lay any concrete tile of the smaller sizes, as ordinarily made, in the more acid peats. In grass and sedge peats having a pH value of 6.0 or higher, however, tiles meeting the following specification should give reasonably satisfactory service: Concrete in the walls of the finished pipe should have 28-day compressive strengths upward from 3,500 lb. per square inch. For drain tile of the smaller diameters, this will mean a minimum average breaking strength of 1,600 lb. per foot of length and a maximum average absorption under 8 percent, after boiling 5 hr. following oven drying.

**Building with logs,** C. P. FICKES and W. E. GROBEN (*U. S. Dept. Agr., Forest Serv., [1944], pp. 39+, about 58 illus.*).—The instructions, illustrations, and discussion here assembled are not intended to cover all the important matters involved in the erection of log buildings, as the authors' primary purpose was that of dealing with the use of the logs themselves. The preparation of plans is not discussed, although several typical ones are shown. The scope of the work covered is indicated by the main specific topics listed in the table of contents, as follows: Preparing logs for use, dimensions, types of corners, floor joists, wall logs, window and door openings, window and door frames, roof framing, shake roofs, partitions, flooring, interior wood finishing, caulking, chinking, daubing, chinkless log cabin construction, hewing timbers, fireplace framing, painting or oiling, and furniture.

**Single unit sawmills for farms and ranches,** C. W. SIMMONS (*Tex. Agr. Col. Ext. [Bul.] B-138 [1945], pp. 39+, about 20 illus.*).—The author points out that harvesting a small number of properly selected uneven-aged trees or small groups of even-aged trees for good forestry from the average size farm or ranch woodland each year is not ordinarily profitable for many commercial sawmill outfits. Such mills usually insist on cutting more good trees than good forestry allows for small forests. This bulletin is concerned with small, light, mobile units with which

the owner of such woodlands can produce lumber on a scale consistent with good forestry practices at a relatively low cost for equipment, and without paying for the work at a rate unprofitable to him. The mills described (of which the construction is dealt with in considerable detail, illustrated by drawings and reproductions of photographs) are designed to be driven by an old automobile engine and to be operated by one or two men. A list of lumber terms is appended.

**Safe use and storage of gasoline and kerosene on the farm** (*U. S. Dept. Agr., Farmers' Bul. 1678, rev. (1945)*, pp. 14+, illus. 8).—Little change has been made in this revision (E. S. R., 67, p. 174).

**Plowing with moldboard plows**, W. ASHBY and A. H. GLAVES (*U. S. Dept. Agr., Farmers' Bul. 1690, rev. (1945)*, pp. 24+, illus. 18).—Little change has been made in this revision (E. S. R., 67, p. 755).

**High-lift power buck rake**, M. B. COX. (*Coop. U. S. D. A. Oklahoma Sta. Bul. 280 (1944)*, pp. 11, illus. 5).—The machinery here described, designed especially to meet the demands of brush removing from rough and formerly unused land now being cleared for pasture and hay, has a hydraulic lift mechanism, raising the rake enough to permit operation over rough ground, depressions, terraces, and the like. When the rake is in the raised position, the points of the teeth are 24 in. above the ground and the rear end is raised to 14 in. The rear lift can be disconnected and the frame made rigid by bolting the channel beams to the guides at the front of the tractor. The action of the cylinders will then be utilized only for tilting the rake, raising the points of the teeth about 18 in. The rake teeth were made of used 2-in. pipe to give more flexibility and strength.

**Buckrakes**, R. N. MILLER (*Wash. State Col. Ext. Bul. 313 (1944)*, pp. 8+, illus. 8).—Although buck rakes are mounted on tractors in front and on auxiliary wheels and axles, as from an old car, the author holds that on an automobile or truck the rake should be mounted behind, rather than in front, because front mountings cause engine overheating and difficulty in air circulation when loaded; and the combined weight (car, rake, and hay) puts a weight on the front assembly that it is not designed to carry. The power lift is emphasized as an important part of the buck rake. Pushing hay to the barn without lifting is pointed out as the usual result of hand lifts. This makes dusty hay and causes loss of leaves. When a transmission power take-off is not available, an extra 4-in. V-pulley or chain sprocket is welded to pulley driving the fan and generator. In the drawings showing the truck-mounted rake, this pulley drives a 12-in. V-pulley which is connected through a drive shaft and two universal joints to a transmission and rear end, the last named part carrying a winding drum for the lifting rope. The adaptation of hydraulic lifts on tractors for lifting buck rakes was not satisfactory. The lift is not high, and when heavy loads were raised the liquid was found apt to be pumped through the bypass valve and not to lift the rake. Other drawings show two simple methods for the construction of the rake itself. Some operating suggestions are offered.

**Special session on new developments in spraying and dusting machinery** (*N. Y. State Hort. Soc. Proc., 90 (1945)*, pp. 112, 115-130).—The following papers are included: Spraying Problems and New Developments in Control Equipment, by P. F. Young (pp. 115-121); Air Blast and High Pressure Sprayer Tests, by W. H. Zehner (pp. 122-125); and A Sixteen Nozzle Swivel Mounted Spray Gun for Orchard Use, by A. B. Burrell (pp. 126-130) (Cornell Univ.).

**Performance of new spray equipment**, H. J. MILLER, D. E. H. FREAR, H. L. KING, and F. N. FAGAN. (*Pa. State Col.*) (*Pa. State Hort. Assoc. Proc., 85 (1944)*, pp. 59-64).—Tests of the performance of the speed sprayer in comparison with broom spraying.

**Sprayer for use on truck crops**, L. R. FARISH (*Miss. Farm Res. [Mississippi Sta.], 8 (1945)*, No. 4, p. 7, illus. 1).—The machine described is said to be suitable

for spraying tall row crops, a type of work for which most sprayers on the market are not adapted. It has flexible connections and can be adapted readily for various methods of spray application, both to low-growing and to tall plants. Powered by traction from the lugged rear wheels, the sprayer operates only while in motion, so that it should not be stopped in turning; but it has good pressure and agitation while in motion. It is designed to be drawn by one horse or mule. The machine is produced by a commercial manufacturer.

**Stokers for tobacco barns**, D. S. WEAVER and N. C. TETER (*Res and Farming [North Carolina Sta.], 3* (1945), *Prog. Rpt. 3*, pp. 1, 7, illus. 3).—The stoker is believed to economize fuel as well as labor. For further fuel saving, insulation is recommended (preferably a standard material), but lacking that, at least a reflecting surface on the inside wall; correct elevation of the heating system; draft regulated by a stack damper; a minimum of 70 ft. of a 12-in. flue for a four-room barn, 110 ft. for a five-room barn; a small stoker; and stoker control by a time clock (the preferred means of regulation) or thermostat. No more ventilation than is required for proper drying should be given.

**Nebraska cream receiving cabinet**, P. A. DOWNS and F. D. YUNG (*Nebraska Sta. Agr. Engin. Prog. Rpt. 10* (1945), pp. 3+, illus. 5).—The refrigerated cabinet here described avoids the lifting of 10-gal. cream cans into immersion cooling tanks by providing side opening storage space for four such cans. Construction is of 4-in. fir flooring; walls, top, and floor having insulating layers of 3.5 in. of shredded redwood bark; the floor space occupied, 7 by 2.5 ft., the height 3 ft. Four 13-in. circular openings in the top are provided with funnels and with 4-in.-thick round covers which fit inside the funnels. Cooling is provided by a 0.25-hp. refrigerating machine with tube and fin-type evaporator placed vertically in the center of the cabinet, behind the center panel between the two doors. An 8-in. fan mounted above the evaporator moves air down over the evaporator coils and around the cans. Average air temperature within the storage space is maintained at around 35° F.

**List of publications on box and crate construction and packaging data, December 1944** (Coop. Univ. Wis.). (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., [1944]*, pp. 16).—The publications listed are classified under the following captions: Nailed wood boxes, nailed wood crates, wirebound boxes, wood-cleated plywood boxes, solid fiberboard and corrugated boxes, barrels, general packaging data, strapping and metal reinforcing, metal fasteners, wood—its properties, etc., miscellaneous container data, carloading and bracing, data on specific commodity containers, and other publication lists issued by the Forest Products Laboratory. Where government publications and other references are cited, those of the government are separately listed.

## AGRICULTURAL ECONOMICS

[**Investigations in agricultural economics by the Ohio Station**] (*Ohio Sta. Bimo. Bul. 234* (1945), pp. 89-93, 115).—Included is an article, Recent Trends in the Farm Real Estate Situation, by H. R. Moore (pp. 89-93), continuing previous work (E. S. R., 91, p. 84) and discussing for the period 1941-44 the market activity, who were selling and buying, mortgage indebtedness, price trends, relations of grades of productivity of land to price trends, etc. The series of Index Numbers of Production, Prices, and Income, by J. I. Falconer, is brought down through March 1945.

**Land market activity in North Dakota: Fourth quarter, 1944**, R. L. BERGER and R. ENGELKING. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 4, pp. 18-21).—This progress report extends data previously noted

(E. S. R., 92, p. 847) through the final quarter of 1944. This period was characterized by a continued rise in prices and a decrease in volume of sales from the peak of 1943.

## RURAL SOCIOLOGY

**Rural sociology: Dimensions and horizons**, L. NELSON. (Univ. Minn.). (*Rural Sociol.*, 10 (1945), No. 2, pp. 131-135).—Considered as the study of human association in the rural environment, rural sociology comprehends not alone the delineation of the areas and subareas of community life, considered in the horizontal aspect, but includes as well the myriad forms of association within the spatial framework. In this latter aspect, it describes all those functions which make up the associational life of rural man.

**Future teaching of rural sociology**, O. D. DUNCAN. (Okla. A. and M. Col.). (*Rural Sociol.*, 10 (1945), No. 2, pp. 135-142; *Span. abs.*, p. 135).—This paper envisions several problems in the future teaching of rural sociology, including the types of students, the values to be emphasized, the challenge of other disciplines, and rural sociology in the scheme of general education. It also stresses the importance of organizing the teaching function more directly around the interest of the student at all levels of instruction, and urges the revision of graduate teaching on the basis of more vital and justifiable standards.

**Contemporary American farm families**, H. J. LOCKE (*Rural Sociol.*, 10 (1945), No. 2, pp. 142-151; *Span. abs.*, p. 143).—The paper analyzes and compares six rural communities of the United States (E. S. R., 86, p. 697; 88, pp. 271, 406; 89, pp. 261, 498). Findings are as follows: The great variation between the highest and lowest degrees of family unity is related to differences in the extent of isolation from deviant behavior patterns, differences in the preservation of family values, and strong v. weak community organization and technics to enforce standards on individuals. The status of farm women and children is high because of their important roles in the cooperative business of farming. Familism prevails among farm families—family members feel that they belong preeminently to the family group; all members participate in the achievement of family objectives, subordinating their individual interests; family members rally to the assistance of a member if he is attacked; and the continuity between the parental family and new family units is maintained through helping sons establish themselves occupationally and in setting up their households.

**The foreign-born white population in North Carolina**, S. C. MAYO (*North Carolina Sta. Prog. Rpt. RS-3* (1944), pp. 9+, illus. 4).—The foreign-born white population in North Carolina comprises a smaller proportion (0.2532 percent) of the total population than in any other State. More than two-thirds of this population is in urban centers. The median age is more than twice that of the total population. Males predominate in this population; the sex ratio is much higher than for the total population. The median school years completed by the foreign-born white population is higher by 2 or 3 yr. than for the total population.

**Farm population changes in North Carolina during 1943**, C. H. HAMILTON. (Coop. U. S. D. A.). (*North Carolina Sta. Prog. Rpt. RS-2* (1944), pp. [7]).—During 1943, the farm population of North Carolina declined 32,400 persons, or approximately 2 percent. The movement of farm people into the armed services during 1943 is estimated at 28,400. However, since approximately 3,000 returned to farms from the armed services, the net loss was only 25,400. In addition to this loss, the farms of the State lost 27,800 people net during the year by migration to and from towns and cities, losing 54,000, but gaining 26,200. During 1943, there were 45,600 births and 12,600 deaths on the farms of North Carolina, or a natural increase of 33,000. The farm population is now 107,800 less than in 1940, although the natural increase has been close to 110,000 during the last 4 yr. This represents a

rate of migration two or three times as great as the civilian migration rate between 1920 and 1940. In the postwar period an increase in farm population is expected.

**Are the college-trained returning to our farms?** S. C. MAYO (*Res. and Farming [North Carolina Sta.], 3 (1945), Prog. Rpt. 3, pp. 6-7, illus. 2*).—According to this study, based on the 1940 census returns, there were living on North Carolina farms in 1940, 8,123 persons 25 yr. old or older who had completed 4 yr. of college and 24,889 who had completed 1 yr. The latter group represented 3.6 percent of all persons on farms 25 yr. old or older, as compared with 16.4 percent in urban centers and 10.4 in rural nonfarm areas. The comparative proportion of white farmers was 4.5 and of nonwhite 1.2 percent, and of males 2.7 and females 4.6 percent.

The 4-yr. group represented only 1.2 percent of the farm population 25 yr. old and older, as compared with 7.4 percent for urban centers and 4.6 percent of the rural nonfarm population. Color and sex differences were found to be about the same as in the 1-yr. group. Of the total number with at least 4 yr. of college training, only 9.7 percent of the men and 14.3 percent of the women were living on farms. In this respect, color differences were very small, but nonwhite females made up 66.9 percent of the nonwhite college-trained population and only 48.9 of the total nonwhite population. The nonwhite men and women represented 25.7 percent of their age-group population on farms, but only 8.3 percent of the college-trained.

In only six States had a smaller proportion of the rural-farm population 25 yr. old or older completed one or more years of college.

**The impact of war on the farm family.** C. R. HOFFER. (*Mich. State Col. (Rural Sociol., 10 (1945), No. 2, pp. 151-156; Span. abs., p. 151)*).—A survey of 275 farm families during 1943 in typical farming areas in Michigan showed that a high percentage were participating in war-related activities, and that those having memberships in local community organizations participated to a greater extent than did families belonging to few or no organizations. Internal relationships of these families were not disturbed unless a member was in the armed forces. In other respects cooperation among members of a majority of the families was increased. Relationships with the local neighborhood and community were also strengthened. Although in many instances funds were available, a high percentage of the families had made no major purchases for living other than the regular ones. Members of these families were doing more farm work than they did before the war began and were helping in every feasible way to promote the war effort.

**Elm City, a Negro community in action.** C. L. SPELLMAN (*Rural Sociol., 10 (1945), No. 2, pp. 174-187; Span. abs., 174*).—The Elm City (N. C.) Negro community began in 1935 after appointment of the first Negro county agricultural agent. It is located on good soil and follows a tobacco and cotton economy, in which 33 percent of the employed Negroes participate, mostly as croppers—tenants in a few cases. Domestic service and common labor consume 41 percent of the others employed. Absence of a significant number of owners makes mobility high, with much actual replacement of Negro families by white families. These factors seriously affect community organizations and functions. A probably desirable outcome, however, is absence of social stratification. The six neighborhoods of the community are united largely through special interest activities of the agricultural extension service; however, the new consolidated high school, resulting from a fire in 1939, grows in importance. The discussion concludes with a descriptive profile of the community, rating characteristics contributory to good community action.

**Farmer opinions on selected problems (Hamilton County).** (*Iowa Sta. Rpt. 1944, pt. 1, pp. 251-254*).—Topics discussed included: The prevailing opinions of 36 selected farmers indicated that the government should help returning soldiers to get farm land, but to a limited extent. Further centralization of schools was favored. Price controls were thought desirable. Conditions were expected to

remain on a fairly even keel following the war's end. Favorable financial income and savings would allow ample margin for unexpected medical expense. More health clinics should be established, but there was no demand among farmers for a group plan for spreading the costs of medical expense or for government administration of such services. Existing price levels were thought satisfactory and should remain so in the postwar period. Farm wages go along with price levels, and an international postwar organization should be established to further the cause of peace.

**Washington farmers weigh the future, C. F. RUESS, P. H. LANDIS and K. H. DAY (*Washington Sta. V Cir.* 22 (1944), pp. 11)**—Analysis of 1,850 replies to some 7,000 questionnaires among the leading farmers of the State yielded the following information: Some 36 percent of those questioned thought that boys and girls returning from military service would be likely to find either a farm or some sort of job in the community, whereas about 45 percent thought it was about a 50-50 chance. Some 39 percent of those questioned thought that there would be a back-to-the-land movement in their neighborhood after the war, compared with some 31 percent who answered no. County zoning which would restrict the use of land not suited for farming either to forestry, grazing, or some other purpose was favored by 51 and opposed by 25 percent. Some 45 percent were not in favor of a county or other agency being authorized to buy out back-country lands where there are people living but where costs of providing schools, roads, and other government services are far higher than the taxes paid by the people, compared with some 23 percent who favored such a plan.

As to the two greatest postwar needs in the neighborhoods and trading areas of those concerned, some 38 percent wanted all-year roads; 32 percent electric power lines; 43 percent more conveniences in homes; 32 percent hospitals in the trading area; 40 percent more industries; and 45 percent better marketing facilities.

The two health problems checked as most important were that the cost of services was often too great for family income, and that the community doctors were over-worked. About one-third of those questioned lived at least 25 miles from the hospital. Some 59 percent thought that a self-supporting health cooperative would help solve their problem, while nearly one-fourth were in favor of a tax-supported program to include complete medical service. Almost half of those responding opposed a tax supported medical program.

Some 48 percent thought that if the government completely abandoned all its programs aiming to adjust agricultural production to demand, farmers would adjust their production to the demand for their products. Some 40 percent thought that the government should not set production goals each year for all major farm products, whereas 35 percent thought the government should do so. Some 40 percent thought that the government should set minimum, or "floor," prices for all farm products, while 21 percent thought the government should set such prices for no products at all. Some 72 percent thought that the United States should try to be as completely self-sufficient as possible, and 12 percent held the reverse opinion. United States production for both United States and foreign markets was favored by 68 percent and production only for the United States by 16 percent.

Some 46 percent thought there was likelihood of a depression within the first 10 yr. after the war. Some 73 percent thought that if private enterprise cannot employ all able-bodied persons wanting to work, the government should do so. Opinions on other topics are also recorded.

**Farm cooperatives and farm women, W. A. ANDERSON ([New York] Cornell Sta. Mimeo. Bul. 16 (1945), pp. 36+).**—Supplementing earlier work (E. S. R., 89, p. 392), the facts found in this study of the knowledge and the attitudes of 544 farm women in three selected New York areas toward farm cooperatives indicated that there is great need for a thorough educational program in the principles and

practices of cooperation in rural communities. Farm women are said to have little accurate knowledge of these principles and practices. Although the women may know only a little about cooperatives, and some of that not too accurately, they nevertheless have opinions about cooperative policies and problems. "There are relatively high positive relationships between the knowledge the women have of cooperatives, their opinions about cooperative policies and problems, and their opinions about the advantages and disadvantages they offer. The relationship is especially high between the opinions they hold about cooperative principles and their opinions relative to the advantages of cooperatives. To assure positive opinions about the advantages of cooperatives, it is basic that the women be educated in sound cooperative principles."

**Farm housing behavior:** An analysis of housing census data, S. RIEMER. (Cornell Univ.). (*Rural Sociol.*, 10 (1945), No. 2, pp. 157-168, illus. 7; *Span. abs.*, p. 157).—This article discusses farmhouse conditions as indicated by market or rental value of the farmhouse. Assuming that a close connection exists between farm income and the value of the farmhouse, it is concluded that specific farmhouse conditions are improved as the income rises. In this manner a rough expression of the urgency of different needs in terms of actual farm-housing behavior at different levels of satisfaction is obtained.

**Farm housing in Argentina,** R. MARCENARO-BOUTELL (*Rural Sociol.*, 10 (1945), No. 2, pp. 168-173, illus. 2; *Span. abs.*, p. 168).—Most Argentine farmhouses are of brick, adobe, or mud, and the national median size is 3.2 rooms. Five major regions can be outlined regarding variations; the most consistently good housing is found in the central east, the poorest in the northeast. The influence of various factors on this problem is suggested as a subject for constructive research.

## FOODS—HUMAN NUTRITION

**Effects of fatness on tenderness of lamb,** S. COVER, A. K. MACKEY, C. E. MURPHEY, J. C. MILLER, H. T. BASS, C. L. BELL, and C. HAMALAINEN (*Texas Sta. Bul.* 661 (1944), pp. 28).—This study covers a period from 1937-42 and is concerned with the selection of comparable animals, the production of differences in fatness, and the estimation of tenderness in the meat. "Six experiments are given in detail with critical appraisal of methods and results. It was found advisable to use paired lambs similar in sex, breeding, conformation, and fleece covering and differing by not more than 2 lb. in initial weight. One lamb of each pair was full-fed so that it would gain as rapidly as possible and the other limited-fed so that it would gain slightly and only enough to keep it in a healthy condition. Both lot feeding and individual feeding were used successfully, but it was necessary to discard some of the lot-fed pairs because the limited-fed lambs had lost weight by the end of the test. The paired-eating method was used for testing tenderness in paired lambs, but observations were recorded also from weighted adjectives, mechanical shear, and chemical analyses for collagen content.

"The full-fed animal was somewhat more tender than the limited-fed one in some pairs, but in other pairs the limited-fed one was more tender. In view of the contradictory results from different pairs within each test, it seems doubtful that fatness influences tenderness in lamb to any marked extent."

"Using fatness or thinness as an indication of tenderness may be regarded as of doubtful practical value in buying lamb."

A bibliography of 27 references is included.

**Enriched corn meal and grits recipes,** M. M. CROWSON (*South Carolina Sta. Cir.* 69 (1945), pp. 16+, several illus.).—This circular, prepared to promote the local (South Carolina) use of enriched corn products, gives a brief popular presenta-

tion of the nutritional advantages of enrichment. Forty-three recipes are included which utilize enriched corn meal or grits in a wide variety of ways (bread, breakfast suggestions, desserts, muffins, rolls, etc.).

The effect of preservation on the nutritive value of food, L. W. HUNT, A. SUNNELL, and A. PFAFF (*Washington Sta. Pop. Bul.* 175 (1944), pp. 24).—This bulletin presents a general discussion of the effect of canning, freezing, dehydration, and storage subsequent to preservation on the nutritive value (vitamin values in particular) of fruits, vegetables, and protein foods. The effect of certain steps, such as blanching and sulfuring, and the importance of satisfactory containers are mentioned in particular.

What's new in freezing foods for home use, J. D. WINTER and A. HUSTRULID (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 2 (1945), No. 3, pp. 1, 11-12, illus. 4).—The findings discussed include such practices as dipping apple slices in a solution of sodium bisulfite before freezing for pie stock; the keeping of peach slices below the surface of the liquid during the storage period and possibly the use of an anti-oxidant to prevent discoloration; the freezing of tougher portions of asparagus stalks to use later in making a puree for soups; the freezing of unpeeled sliced eggplant after dipping in water acidified with lemon juice and blanching; the freezing of a squash puree (using "dry" types of squash) for use in "pumpkin" pies; the freezing of sweetpotato slices prepared from baked, cooled sweetpotatoes peeled and treated with diluted lemon juice and a coating of sugar; and the freezing of eggs, first broken, then separated or mixed, and treated with 1 tablespoonful of light colored corn sirup in order to prevent undesirable coagulation of the yolk in freezing. The advantages of home freezers are discussed briefly.

The effects of commercial processing and of storage on some nutritive properties of milk: Comparison of full-cream sweetened condensed milk and of evaporated milk with the original raw milk, K. M. HENRY, J. HOUSTON, S. K. KON, and S. Y. THOMPSON (*Jour. Dairy Res. [London]*, 13 (1944), No. 3, pp. 329-339).—This work was begun in August 1940 and is a continuation of the authors' earlier experiments (E. S. R., 81, p. 565; 82, pp. 385, 673; and 84, p. 519). The effect of processing and storage upon the biological value, true digestibility, and vitamin content of condensed and evaporated milk, as compared with raw milk, was studied. The assay methods and experimental technics employed were those evolved by Kon et al. Vitamin A and carotene were measured in a Lovibond tintometer, riboflavin was measured fluorometrically, vitamins C and B chemically, and the protein values were obtained by rat assay, using approximately a 7-percent protein level. The results obtained showed that the biological value and true digestibility of the protein of raw, condensed, and evaporated milk were, respectively, 85.6 and 94.2, 84.6 and 98.8 and 84.1 and 93.7. The digestibility of condensed milk was considered significantly higher than that of raw and evaporated milk. No loss of vitamin A, carotene, or riboflavin due to processing was observed. The mean loss of vitamin C was 10 percent for condensed and 60 percent for evaporated (corresponding to more severe heat treatment). The vitamin B<sub>1</sub> losses were 3.5 and 27 percent, respectively, for condensed and evaporated milks. Storage of condensed milk for 1 yr. at 15° C. or 6 mo. at 37° showed no loss of vitamin A, carotene, or riboflavin at the lower temperature, but a 42 percent loss of vitamin C and a 30 percent loss of B<sub>1</sub>. At 37° losses were: Riboflavin, 35 percent; vitamin C, 64 percent; and vitamin B<sub>1</sub>, 93 percent.

The effect of denaturation upon the sulfur content of egg albumin and edestin, B. M. HENDRIX and J. DENNIS (*Arch. Biochem.*, 2 (1943), No. 3, pp. 371-380, illus. 4).—A solution of dry (but not crystalline) egg albumin was prepared by saturating fresh egg whites with NaCl, filtering off the flocculated globulins, and precipitating the egg albumin from the filtrate by adding a saturated solution

of  $\text{K}_2\text{HPO}_4$ . After dialyzing the precipitate, the resulting solution was evaporated to dryness at room temperature. The product thus produced (S content 1.645 percent) resembled crystalline egg albumin in its physical properties, being soluble in water and coagulable by heat. Sulfur values of acid and alkali denatured albumins were lower than those of the albumin from which they were prepared, by procedures described in detail, thus indicating that sulfur-rich materials were split off by these treatments. The addition of water to the protein appeared to accompany the denaturation. Alkali denaturation of edestin resembled the alkali and acid denaturations of albumin. Acid denaturation of edestin differed in showing no loss of sulfur from the protein.

**The effect of dry grinding on the properties of proteins, I-IV,** H. R. COHEN (*Arch. Biochem.*, 2 (1943), Nos. 1, pp. 1-8, illus. 2; 3, pp. 345-361, illus. 5).—Studies on the denaturing effect produced on protein by dry grinding in a porcelain ball mill, filled to one-half capacity and rotated at approximately 100 r. p. m., were carried out on ovalbumin, casein, gelatin, and hemoglobin. In general, it appeared that water-soluble fractions of the proteins were denatured into fractions which were insoluble in water, and conversely that the water-insoluble protein fractions produced fraction which were water soluble. The water-soluble fractions produced by grinding were low in tryptophan.

**I. Native, denatured, and coagulated ovalbumin** (pp. 1-8).—The author concluded from electrophoretic analysis of the water-soluble proteins from the three albumin preparations that there may be a stepwise degradation produced by the grinding process. Results of peptic digestion and analyses for nitrogen, sulfur, tryptophan, and tyrosine indicated a decided disintegration of the protein molecule. The dry grinding of native crystallized ovalbumin yielded a highly insoluble protein somewhat resembling coagulated ovalbumin.

**II. Studies on casein** (pp. 345-351).—The repeated dry grinding of washed casein produced water-soluble protein having a higher phosphorus content and a much lower tryptophan content than the native casein. Of the water-soluble fractions from the batches of material resulting from each of four successive grindings, only the fraction from the first grinding yielded a loose clot when treated with rennin. The water-soluble protein was partially deficient (even with added tryptophan), but maintained mice in constant weight.

**III. Gelatin** (pp. 353-355).—Dry grinding of gelatin converted it into a cold water-soluble protein. The time required for gel formation increased with prolonged grinding. No increase in the formol titration value during grinding was interpreted as indicating no splitting of peptide bonds.

**IV. Human, beef, and hog coagulated hemoglobins** (pp. 357-361).—A high percentage (79 percent in 384 hours' grinding) of coagulated hemoglobin was converted into water-soluble protein by dry grinding. The nitrogen and tyrosine fractions of the water-soluble proteins decreased with successive grindings. The large amounts of diffusible nitrogen produced and the precipitability of the protein in the water-soluble fractions by various reagents was interpreted as indicating that small molecular weight particles were present. Spectrographic analyses also indicated considerable degradation of the protein molecule.

**Industrial feeding management** (*U. S. Dept. Agr., War Food Admin.*, 1945, NFC-14, pp. 64+, illus. 3).—This publication, superseding [NFC-1], Manual of Nutrition (E. S. R., 89, p. 766), has been planned to assist industry and food service managers in providing well served meals of high nutritive value at a price attractive to the majority of workers. Basic menu patterns are given for several types of feeding services, such as cafeterias and mobile units for example. Standards for meal service involve certain requirements including those for quality, attractiveness of service, advance menu planning, particular planning and preparation of food

for each meal, and cost control. Food purchasing and preparation is discussed with emphasis on vitamin retention. The facilities and equipment necessary for practical operations are outlined, and the principles upon which the choice of facilities and equipment should be based are discussed. The management of food-service employees with an outline of job descriptions is reviewed in detail and correlated with the types and design of the facilities mentioned. Methods of conducting nutrition-education activities within the plant are indicated, and a list of pamphlets, posters, films, or other promotional material is given.

Inadequate diets and nutritional deficiencies in the United States, their prevalence and significance, H. D. KRUSE ET AL. (*Bul. Natl. Res. Council*, No. 109 (1943), pp. 56+).—This bulletin, a report of the Committee on Diagnosis and Pathology of Nutritional Deficiencies, Food and Nutrition Board, presents the results of dietary surveys and nutritional appraisals collected from numerous sources over a period of a decade. Considerable previously unpublished material is included in the review, which has been so prepared as to present all data on a uniform, authoritative, and comparable basis. A bibliography of 189 references is listed. Discussion of the findings in terms of the recommended daily allowances of the board is subdivided under the various chapter headings: Prevalence of inadequate diets as shown by surveys; deficiency states—their causes, forms, and detection; prevalence of deficiency states; significance of deficiency states and optimum nutrition; and summary and conclusions.

The authors conclude that moderately inadequate diets are widespread throughout the nation. Most deficiency states produced are mild or moderate and gradual in their course. Corrective steps for their detection and therapeutic treatment are recommended as follows: "(1) Preparation of a handbook on methods of detecting deficiency states; (2) establishment of training centers for instruction in the medical aspects of nutrition, especially diagnosis of the deficiency states; and (3) introduction of adequate courses on nutrition, particularly its clinical aspects, into medical schools."

A dietary factor essential for guinea pigs, I, II. (Oreg. State Col.). (*Arch. Biochem.*, 1 (1943), No. 3, pp. 373-377; 3 (1944), No. 3, pp. 305-310).

I. Isolation from raw cream, W. J. van Wagendonk and R. Wulzen.—After 1 mo. on a basic diet composed of skim milk 100 cc., skim milk powder 10 gm., ferric chloride 0.82 mg., and copper sulfate 0.78 mg., supplemented daily with orange juice 1 cc. per 100 gm. body weight and carotene 150 International Units, weaned guinea pigs developed a deficiency syndrome characterized by stiffness of the wrists. Active fractions that could be isolated from raw but not from pasteurized cream, by the method noted below, caused the stiffness to disappear.

The preparation of the active fraction involved saponification of the butter obtained by churning 15 gal. of raw cream with hot ethanolic potassium hydroxide (20 percent) in an atmosphere of nitrogen, followed by separation of the active fatty acids by acidification of the cooled mixture with 5 percent sulfuric acid. This active fraction was then washed, steam distilled in an atmosphere of nitrogen, and extracted with peroxide-free ether. This extract was treated with 5 percent potassium hydroxide until the water layer stayed clear on acidifying, and the ether solution was then washed free from alkali and dried over anhydrous sodium sulfate. The ether was distilled off in an atmosphere of nitrogen yielding a yellow oil (66 gm.), which was dissolved in a 10-percent glacial acetic acid-absolute-ethanol mixture and refluxed with trimethyl acehydrazide ammonium chloride, partially neutralized with 1.0 N sodium hydroxide in the presence of ice, and refluxed with ether; the contents of the extractor were acidified with 1.0 N sulfuric acid, and again refluxed with ether. The final ether extract thus obtained was dried over anhydrous potassium carbonate and then distilled under nitrogen. The 62 mg. of

high potency material obtained were converted to the mercuric iodide complex of trimethyl acethydrazide ammonium chloride, this crystalline precipitate being purified by recrystallization from 95 percent ethanol. Further purification was effected by dispersing in 1.0 N sulfuric acid, precipitating the mercury as HgS, removing the excess hydrogen sulfide, and extracting with ether, which was finally removed in vacuo, yielding a pale yellow oil (3 mg.) active in a dosage of 1 $\gamma$ . Analysis of the mercuric precipitate indicated a compound having a molecular weight around 200, containing only one carbonyl group, and not identical with methyl vinyl ketone.

II. A comparative study of the creatine excretion of animals on a diet deficient in this factor and in vitamin E, W. J. van Wagendonk, V. Schocken, and R. Wilzen.—This investigation, undertaken to differentiate between vitamin E avitaminosis and deficiency in the antistiffness factor (ASF), using urinary creatine excretion as a criterion, employed 400-gm. guinea pigs, which were divided into five groups. One group (four animals), serving as a positive control, received a stock diet composed of rolled oats, straw, and greens ad libitum. The other four groups (six animals each) received a basal ration free of vitamin E and deficient in the ASF, and composed of vitamin-free casein 1,050 gm., dextrin 4,830 gm., dried irradiated brewers' yeast 700 gm., salt mixture 420 gm., and orange juice (fed separately each day) 1 cc. per 100 gm. weight. Of these four groups, the negative control received no supplement, while the test groups received [daily] supplements of the ASF (125  $\mu$ g.), or vitamin E (3  $\mu$ g.  $\alpha$ -tocopherol), or both. Assays of urinary creatine and creatinine and tests for stiffness were tabulated and showed that avitaminosis E alone produced muscular dystrophy accompanied by creatinuria. A deficiency in the ASF produced a characteristic wrist stiffness, with no significant effect upon creatine excretion. On a combined deficiency, both types of symptoms developed simultaneously and independently, resulting in a greater degree of paresis than that produced by a deficiency of either factor alone. Animals fed both supplements thrived well, remained in good health, but did not increase in weight as rapidly as the control animals on the stock diet.

A dietary factor, essential for guinea pigs.—III, Changes in the distribution of acid-soluble phosphorus in the liver and kidneys during deficiency, W. J. VAN WAGENDONK. (Oreg. State Col.). (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 337-343).—Guinea pigs 11 to 12 weeks of age and weighing from 300 to 350 gm. were segregated and placed on autoclaved straw and fed ad libitum twice a day a diet of the following composition: Skim milk powder 16 gm., copper sulfate 0.25 mg., ferric chloride 0.25 mg., and water 84 gm. To the morning diet was added a solution of the water-soluble vitamins to provide an adequate daily intake of the various B vitamins, while an adequate daily supplement of the fat-soluble vitamins was added to the evening food. Once a week 50 mg. crystalline *l*-ascorbic acid (dissolved in water immediately before use) was given by mouth. Water and iodized salt were provided ad libitum. The animals on this deficient (in ASF) diet gained as regularly in weight as stock animals, and showed no other deficiency symptoms except a constantly increasing stiffness at the wrist joint. Upon autopsy, the animals which had been maintained on this diet a year or more showed large deposits of calcium triphosphate in nearly all body tissues. Analysis of the distribution of acid-soluble phosphorus in the liver and kidney of normal and deficient guinea pigs showed that the concentration of easily hydrolyzable phosphorus in both organs markedly decreased during the deficiency while the inorganic phosphorus showed a sharp increase, and total acid-soluble phosphorus was also increased. An increase in the mercuric-insoluble phosphorus noted in the liver but not in the kidney seemed to be correlated with a decrease in the easily hydrolyzed phosphorus. Addition of the antistiffness factor would prevent an abnormal distribution of the acid-soluble phosphorus or restore the distribution to normal. The results are

considered to indicate a derangement in the phosphorus metabolism. A possible interpretation of the abnormal distribution of the acid-soluble phosphorus is presented.

A dietary factor essential for guinea pigs, IV, V. (Oreg. State Col.). (*Arch. Biochem.*, 5 (1944), Nos. 2, pp. 273-278, illus. 1; 3, pp. 329-335).

IV. *Serum phosphatase during deficiency*, W. J. van Wagtendonk, A. S. Rathkey, C. E. Ballou, and R. Wulzen.—Guinea pigs fed a diet deficient in antistiffness factor (ASF) showed a decided decrease in alkaline serum phosphatase in comparison with guinea pigs fed a stock diet. Addition of excess ascorbic acid did not prevent this change, nor did the addition of a dose of ASF (sufficient to alleviate other symptoms) succeed in bringing about a return to the normal level. Continuous administration of the ASF, however, did prevent a decrease of the serum phosphatase.

V. *Phosphorus and calcium content of the blood and muscle during deficiency*, W. J. van Wagtendonk, A. M. Freed, and C. E. Ballou.—Changes in the calcium and inorganic phosphorus content of blood and the calcium content of muscle, produced in the guinea pig maintained on a diet deficient in the antistiffness factor (ASF), were studied. A significant rise in muscle calcium, which persisted throughout the length of the experiment (57 weeks), and increases in both blood calcium and inorganic phosphorus were observed. Addition of small amounts of ASF over a short period of time (0.01 $\gamma$  to 10.0 $\gamma$  during the last 5 days) had no appreciable effect on the high calcium level in the muscle while ameliorating the calcium and inorganic phosphorus levels of the blood. However, it was found that prolonged administration of large doses (1,000 units per day) of the ASF eventually resulted in a removal of even large deposits from the tissues, as indicated in a personal communication to the senior author from Wulzen.

A dietary factor essential for guinea pigs.—VI, Changes in the distribution of acid-soluble phosphorus in the muscle during a deficiency of the antistiffness factor, W. J. VAN WAGTENDONK and H. LAMFROM. (Oreg. State Col.). (*Jour. Biol. Chem.*, 158 (1945), No. 2, pp. 421-424).—Comparisons of the inorganic phosphorus, the creatine phosphate, and the adenosine di- and triphosphate content of the muscle (rectus femoris) of guinea pigs maintained on a stock diet or one deficient in the antistiffness factor (ASF) were carried out. The tabulated results showed an increase in the inorganic phosphorus content in the muscle during the deficiency, which paralleled a similar high concentration of calcium previously observed. A significant decrease in creatine phosphate and adenosine triphosphate values was noted on the deficient diet, particularly in the more advanced stages of the deficiency occurring after 19 or more weeks on the deficient diet.

The effect of pH on the availability of *p*-aminobenzoic acid to *Neurospora crassa*, O. Wyss, V. G. LILLY, and L. H. LEONIAN. (W. Va. Expt. Sta.). (*Science*, 99 (1944), No. 2558, pp. 18-19).—The fungus was grown in a basic nutrient solution consisting of 25 gm. dextrose, 1 gm. potassium dihydrogen phosphate, 0.5 gm. magnesium sulfate, 2 gm. casein hydrolysate, 1.32 gm. Norit-purified fumaric acid, 0.2 p. p. m. each of iron and zinc, 0.1 p. p. m. manganese, 1  $\mu$ g. biotin, and 1,000 cc. distilled water. Enough sodium hydroxide was added to adjust the pH to the various levels. Twenty-five cc. of this solution with various additions of *p*-aminobenzoic acid (0.00625-3.2  $\mu$ g.) was placed in 250 cc. flasks, autoclaved, inoculated with a loopful of a suspension of germinating spores, and incubated for 72 hr. at 25° C. The mycelium was harvested, dried at 85° for 24 hr., and weighed. The authors noted that although the fungus gave variable results, with the amount of growth fluctuating over a wide range under apparently identical conditions, nevertheless the fundamental principle of its behavior remained the same, namely, the effectiveness of *p*-aminobenzoic acid as a growth factor decreased with an increase in pH. Substantially the same results were obtained when the

agar medium of Tatum and Beadle (E. S. R., 88, p. 180) was used. It is concluded that the efficiency of the vitamin in the nutrition of *N. crassa* is probably a function of the molecular form of the vitamin rather than of the ion.

Vitamin content of some mature and germinated legume seeds, P. R. BURKHOLDER and I. McVEIGH (*Plant Physiol.*, 20 (1945), No. 2, pp. 301-306, illus. 1).—Microbiological assays were made for thiamine, riboflavin, pyridoxine, niacin, pantothenic acid, inositol, vitamin B<sub>6</sub>, biotin, and ascorbic acid in mature and sprouted seeds of garden pea, mung bean, and seven varieties of soybean. On a dry weight basis, niacin, riboflavin, and ascorbic acid increased greatly during germination. Certain other vitamins showed small gains, thiamine generally remained unchanged, and vitamin B<sub>6</sub> appeared to decrease. The possible significance of these results for studies on growth processes and in relation to the use of sprouted seeds for preparing high quality processed foods is briefly discussed.

Ascorbic acid, riboflavin, and thiamine content of chocolate milk, A. D. HOLMES, C. P. JONES, A. W. WERTZ, and W. S. MUELLER. (Mass. Expt. Sta.). (*Amer. Jour. Diseases Children*, 69 (1945), No. 3, pp. 157-159).—Assays were carried out on freshly prepared samples of chocolate milk made with American-process or Dutch-process cocoa. The Dutch process involved an alkali treatment of the cocoa (reducing the fat content somewhat and producing a darker product), which gave the cocoa sirup used in the experiments a pH of 7.12 as compared with 5.05 for the American-process cocoa sirup. No appreciable change in the pH of the final chocolate milk product was apparent (pH 6.7 v. pH 6.5); however, the vitamin assays showed a slight but consistently higher value for the milk using American-process cocoa. Tabulated data, compared with values obtained on pasteurized whole milk, gave values (in milligrams per liter) for ascorbic acid, riboflavin, and thiamine, respectively, of 15.4, 1.50, and 0.31 for the American-process chocolate milk, and 11.5, 1.37, and 0.25 for the Dutch-process chocolate milk. No storage studies were made.

The possible existence of a microbiologically inactive "folic acid"-like material possessing vitamin activity in the rat, A. D. WELCH and L. D. WRIGHT (*Science*, 100 (1944), No. 2590, pp. 153-154).—Weaned rats were fed a diet considered low in folic acid (0.7-1.8 µg. per 100 gm. of diet as assayed by both *Lactobacillus casei* & and *Streptococcus lactis* R). The diet consisted of powdered whole milk suitably reinforced with vitamins and minerals. Succinylsulfathiazole in amounts as large as 10 percent was added to one portion of the diet. No evidence of leucopenia or other nutritional deficiencies was observed in the rats during a period of 14 weeks on the milk-sulfonamide diet or the milk ration alone. "Assays for folic acid in the tissues of these and other rats showed that considerably larger amounts of microbiologically active material were present in the hepatic tissue of animals fed a whole milk ration than were found in the liver of rats given a highly purified diet 'contaminated' with a comparable amount of folic acid. In each case the addition of succinylsulfathiazole to the diet caused a marked reduction in the folic acid content of the liver; however, the reduction was notably greater in the case of animals given the sulfonamide in highly purified diets. The above observations suggest that one (or more) of the components of milk may be utilized by the rat for growth and other purposes in lieu of material possessing the microbiological activity of folic acid."

Relation of the *Streptococcus lactis* R factor to "folic acid," J. L. STOKES, J. C. KERESZTESY, and J. W. FOSTER (*Science*, 100 (1944), No. 2606, pp. 522-523, illus. 1).—Further studies on the *S. lactis* R (SLR) factor (E. S. R., 91, p. 780) show that folic acid is formed when *S. lactis* R is grown in a folic acid-free medium containing the SLR factor. *Lactobacillus casei*, and other lactic acid bacteria which require folic acid, produce maximal growth and fermentation in folic acid-

free media to which the whole culture, cells, or culture fluid of *S. lactis* R grown in the presence of SLR factor had been added. The authors presume that the SLR factor per se is transformed into folic acid, as the amount of folic acid formed increases as the quantity of SLR factor in the medium is raised. Moreover, folic acid is produced when washed cells of *S. lactis* in a water solution of the SLR factor are incubated for 3-4 hr. at 30° C., under which conditions all growth is largely eliminated. A number of lactic acid bacteria are listed in relation to their requirements of SLR factor or folic acid. SLR, unlike xanthopterin, does not give rise to folic acid when incubated with rat liver suspensions.

The effect of *L. casei* factor ("folic acid") on blood regeneration following hemorrhage in rats, A. KORNBERG, H. TABOR, and W. H. SERRELL (*Amer. Jour. Physiol.*, 142 (1944), No. 4, pp. 604-614, illus. 1).—Employing a technic, described in detail, which involves using litter-mate rats of the same sex and removing a measured volume of blood (equivalent to 2 percent of the body weight) at frequent intervals, the influence of purified diets with or without sulfasuxidine or *Lactobacillus casei* E factor ("folic acid") on the production of hemorrhagic anemia was studied. Tabulated data showed that the hematocrit value, hemoglobin concentration, and total leucocyte and polymorphonuclear count were all extremely low in the animals fed sulfasuxidine, while rats on a similar diet supplemented by "folic acid" (2.5% daily) showed nearly normal values. It was observed that "severe anemia may be produced regularly in rats fed a sulfasuxidine-containing, purified diet and subjected to hemorrhages. In rats fed the same diet but not bled, anemia occurs in only a small percentage of the cases. Development of the anemia is more dependent on the length of time that the diet has been fed than on the length of the bleeding period. Crystalline *L. casei* factor ('folic acid') has been found to have a preventative and corrective action on this hemorrhagic anemia. Rats fed a purified diet alone did not develop anemia when bled to the same extent as the sulfasuxidine-fed rats. It is probable that the ingestion of sulfasuxidine in a purified diet creates a deficiency state in which repeated hemorrhages may make a latent erythropoietic inadequacy manifest. The use of hemorrhage as a 'load-test' is suggested for the detection of latent hemopoietic inadequacy. The availability of a simple technic for repeated standardized bleeding of large numbers of small animals encourages the use of such a test."

Vitamin A and dark adaptation, J. YUDKIN, G. W. ROBERTSON, and S. YUDKIN (*Lancet [London]*, 1943, II, No. 1, pp. 10-13, illus. 9).—Four hundred apparently normal subjects were tested over the complete course of dark-adaptation. Repeated measurements showed that the readings for any one subject were reproducible within narrow limits, the variations rarely exceeding 0.2 log unit for cone or rod threshold and 2 min. for the cone-rod transition time. The tests, described in detail and using a modification of Crook's apparatus, lasted for a period of 40 min., and indicated that the course of adaptation varied considerably in different individuals, with the visual threshold in the early stages of adaptation (the first 10 min.) not necessarily being related to the readings of the final rod threshold. Administration of vitamin A, if it affected the dark adaptation at all, always affected the final rod threshold. Other possible effects, in addition, were alteration in final cone threshold, cone-rod transition time, and both final cone threshold and cone-rod transition time. The authors concluded that if single readings alone were to be used to assess performance in the dark, they would be made best in conditions approaching complete adaptation.

Adsorption phenomenon of beta-carotene, J. C. BAUERNFEIND, W. BAUMGARTEN, and C. S. BORUFF (*Science*, 100 (1944), No. 2597, pp. 316-317, illus.).— $\beta$ -carotene, dissolved in skellysolve B and adsorbed on activated alumina, formed two pigment bands when the chromatogram was developed with chloroform. The

top narrow orange band "T" moved slowly, as contrasted to the lower broad  $\beta$ -carotene band which passed rapidly down the column. Other organic solvents used did not possess the resolving power of chloroform. Five commercial crystalline carotene preparations possessed from 3.0 to 4.9 percent of the T pigment under these conditions. In skellysolve B,  $\beta$ -carotene has an adsorption curve with a maximum at 450, while pigment T has a maximum at 427 m $\mu$ . Experiments demonstrated that the T pigment is formed continuously. When a purified chloroform was used the separation effect of the two bands did not occur, but the addition of as little as 0.2 percent methanol restored the resolving power of the chloroform. The authors believe that, under the conditions encountered,  $\beta$ -carotene may undergo isomerization or some other spontaneous change, and that the chloroform-methanol solution separates the newly formed compound on the column by shifting the adsorption affinity of the compounds.

**Digestibility by rats of  $\alpha$ -,  $\beta$ -, and neo- $\beta$ -carotenes in vegetables,** G. S. FRAPS and W. W. MEINKE. (Tex. Expt. Sta.). (*Arch. Biochem.*, 6 (1945), No. 2, pp. 323-327).—Using the term "digestibility" to indicate the difference between the amount fed and the amount excreted, the authors have tabulated their results obtained in feeding raw and cooked carrots and several other cooked or canned vegetables. "The digestibility of the  $\beta$ -carotene in 17 tests with adult rats weighing about 300 gm. and receiving 20  $\mu$ g. of crude carotene per day ranged from 8 percent with boiled carrots to 55 percent with boiled mustard greens, and averaged 32 percent. In 14 tests when the rats received 60  $\mu$ g. crude carotene per day, the digestibility of the  $\beta$ -carotene ranged from 18 percent with canned pumpkins to 49 percent with raw carrots, and averaged 34 percent. The digestion of the  $\alpha$ -carotene averaged 47 percent with rats receiving 20  $\mu$ g. crude carotene per day and 33 percent for those receiving 60  $\mu$ g. per day. The digestibility of the neo- $\beta$ -carotene B was practically the same as that of the  $\beta$ -carotene. The average digestibility of the carotene in the four greens was higher (44 percent) than in the other vegetables, especially carrots and pumpkins. The digestibility of  $\beta$ -carotene and  $\alpha$ -carotene dissolved in oil was about 57 and 64 percent, and was appreciably higher than that of the average of the carotene in vegetables (32 to 34 percent)."

**Telang liver and vitamin A toxicity,** E. J. HERBST, P. L. PAVCEK, and C. A. ELVEHJEM. (Univ. Wis.). (*Science*, 100 (1944), No. 2598, pp. 338-339).—Telang beef liver was fed to weanling rats as the sole diet, plus a daily supplement of 25 mg. calcium carbonate. The results, summarized by the authors, indicated: "About 20 percent of fresh telang livers were toxic to weanling rats receiving the calcium-supplemented livers as their sole dietary. The symptoms observed in rats were growth failure and multiple spontaneous fractures of the bones of the extremities. The toxicity of certain telang livers was due to their abnormally high stores of vitamin A. When these livers, supplemented only with calcium carbonate, were fed to weanling rats, the daily intake of vitamin A was in excess of the toxic dosage of 15,000 International Units per day. Identical symptoms of toxicity were observed in weanling rats fed 20,000 I. U. of crystalline vitamin A per day in conjunction with a standard stock ration."

**The effect of deficiencies of the filtrate fraction of the vitamin B complex and of nicotinic acid on teeth and oral structures,** H. BECKS and A. F. MORGAN (*Jour. Periodontology*, 13 (1942), No. 1, pp. 18-30, illus. 20).—Dogs fed diets adequate with the exception of a filtrate fraction of the vitamin B complex and/or nicotinic acid, developed pronounced dental changes. Filtrate fraction deficiencies alone led to rampant decay in young dogs and severe malformation and resorption of roots and parradental bone structure in older animals. Nicotinic acid deficiencies alone led to gingival disturbances, but no dental and osseous changes such as observed in the animals suffering both filtrate fraction and nicotinic acid deficiencies simultaneously, or filtrate fraction deficiency alone.

Comparative study of oral changes in dogs due to deficiencies of pantothenic acid, nicotinic acid, and unknowns of the B vitamin complex, H. BECKS, W. W. WAINWRIGHT, and A. F. MORGAN. (Univ. Calif.). (*Amer. Jour. Orthodontics and Oral Surg.*, 29 (1943), No. 4, pp. 183-207, illus. 23).—Elaborating upon the above study, purebred Cocker spaniels were maintained for as long as 3 yr. on purified diets considered adequate with the exception of nicotinic acid and a "filtrate fraction" (ff) of the vitamin B complex. The (ff) was considered to be a rich source of pantothenic acid and of all other B vitamins with the exception of thiamine, pyridoxine, riboflavin, and nicotinic acid. In certain experiments pantothenic acid was substituted for the whole (ff). The severe oral changes described were considered manifestations of the respective deficiency produced. Nicotinic acid deficiency produced marked gingival and paradental changes, with severe inflammation of the entire mucous membrane. Deficiency in the entire (ff) of the B complex led to severe impairment of the health in young growing dogs, as well as epithelial necrosis and degeneration. Addition of pantothenic acid alone markedly reduced the severity of the pathological symptoms. When both nicotinic acid and (ff) were omitted (2 yr. or more), additional circulatory changes and edema occurred in addition to the symptoms described above. A brief resume of the symptoms produced by deficiencies in other members of B complex is included, as well as over 100 references on the subject.

Growth-retarding effect of corn in nicotinic acid-low rations and its counteraction by tryptophane, W. A. KREHL, L. J. TEPLEY, P. S. SARMA, and C. A. ELVERHJEM. (Wis. Expt. Sta.). (*Science*, 101 (1945), No. 2628, pp. 489-490, illus. 1).—Growth retardation produced in rats fed a low protein (12.4 percent) ration containing 40 percent corn meal or grits can be counteracted by the addition of either 50 mg. 1(-) tryptophan or 1.0 mg. nicotinic acid to the diet. When the 40 percent corn meal is included in a diet providing a protein level of 15.4 percent, there is no adverse effect on growth. The influence of the tryptophan level of the diet on the adverse effect of corn meal is discussed.

Photolysis of riboflavin in milk, O. E. STAMBERG and D. R. THEOPHILUS. (Idaho Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 269-275).—As much as 40 percent of the riboflavin in milk was destroyed after 2 hours' exposure to direct sunlight in clear quart bottles, even though the milk was kept quite cool. Good shade, brown glass bottles, or paper containers gave good protection. After milk was exposed to sunlight and subsequently stored in the dark in a refrigerator, there was no further loss of riboflavin for the 20 hr. investigated. The loss of riboflavin was much less at freezing than near the boiling temperature. Photolysis of riboflavin in raw milk was generally greater than in pasteurized milk and least in homogenized milk. Milk in a store show case close to a window lost some riboflavin, but there was little loss when most of the light came from low-intensity electric lights. As much as 11-12 percent of the riboflavin was lost due to daylight when milk was allowed to simmer for 30 min. in a covered glass pan or uncovered aluminum pan in a bright room, but there was practically no loss of riboflavin when a covered aluminum pan was used. The samples were stored for about 2 hr. at 42° F. before making the test. Raw, pasteurized, and pasteurized-homogenized samples were investigated.

Studies on the riboflavin content of cheese, I. L. HATHAWAY and H. P. DAVIS (*Nebraska Sta. Res. Bul.* 137 (1945), pp. 12).—The riboflavin content of 27 kinds of cheeses and cheese spreads was determined by rat assay comprising 15 experiments and utilizing 1,223 animals. Riboflavin values reported for the individual cheeses (including some designated only by trade name), which are classified as hard, semihard, soft, or processed, varied from 1.2 µg. to 13.5 µg. per gram.

Imbalance of vitamin B factors: Pyridoxine deficiency caused by additions of aneurin and chalk, M. B. RICHARDS (*Brit. Med. Jour.* No. 4395 (1945), pp.

433-436, illus. 2).—A synthetic diet consisting of white flour 1,020 gm., commercial casein 400 gm., dried brewers' yeast 32 gm., salt mixture 33.3 gm., margarine 180 gm., radiostoleum (containing 1 gm.  $\alpha$ -tocopherol acetate per 50 cc.) 2 cc., KI 0.00616 gm., and  $MnSO_4 \cdot 4H_2O$  0.0616 gm., and supplemented with chalk and three levels of vitamin  $B_1$  was fed to groups of rats from weaning until mating (at about 115 days) in experiment I. The basal diets were planned to be approximately comparable in Ca content and caloric value to an original poor human diet containing a large proportion of white bread. The supplements of chalk corresponded to the amount of Ca in "fortified" bread, whereas the "low" and "medium"  $B_1$  levels corresponded to fortified and "National wheat" flour levels, while the "high"  $B_1$  level corresponded to 10 times the latter amount.

Supplementary breeding or lactation tests were made (experiment II) in which the above diets were fed with the addition of 10 cc. or 20 cc. of milk per head. The growth tests (experiment I) showed no marked differences between groups, with the exception of slightly better weight gains at each  $B_1$  level when chalk was incorporated in the diet. In the lactation tests (experiment II), marked differences in rate of growth, survival of litters, and symptoms attributed to pyridoxine deficiency were observed. At each level of  $B_1$  the groups receiving chalk fared worse than the corresponding group without chalk. The lactation performance decreased as the level of  $B_1$  increased. Milk at a 20-cc. level reduced the severity of the symptoms produced at the 10-cc. level. On a low  $B_1$  diet without chalk (2), normal weight curves were obtained and no convulsive symptoms were noted; on a high  $B_1$  level, convulsive symptoms appeared, which were aggravated by the addition of chalk to the diet to the point that few of the litters survived. The experiments were repeated with a control series receiving a daily supplement of 40 $\gamma$  pyridoxine. Here, no convulsions were observed and growth was normal. The does receiving high  $B_1$  plus chalk, and without pyridoxine, showed characteristic convulsions in seven out of eight litters. A discussion of the possible implication in the human diet when a large excess of vitamin  $B_1$  is given in the treatment of various diseases or nutritional conditions is included.

Vitamin C in plants, [I-III] (*Nature [London]*, 153 (1944), No. 3892, pp. 683-684).

[I.] "Nasturtium" (*Tropaeolum majus*), M. D. Sutherland.—In New Zealand the leaves of the nasturtium, *T. majus*, are used as a salad food and provide a very rich source of vitamin C, the concentration ranging from 200 to 465 mg. per 100 gm. on the samples tested. Small leaves tend to have higher values than large leaves. Stalks contain 100-160 mg. per 100 gm. and are also a rich source of C. Little or no dehydroascorbic acid is present, although the ascorbic acid oxidase is highly active in disintegrated tissues. An extract, prepared by adding leaves to boiling water until no more can be immersed, boiling 3 min. more, and draining, normally contains more than 150 mg. of ascorbic acid per 100 cc., and if sealed away from air is fairly stable. It has not the pungent taste of the fresh leaves, this being lost during boiling.

[II.] Iris (*Iris germanica*), E. J. Baumann.—The common iris (*I. germanica*) is recommended as a superior source of ascorbic acid. The young undried leaves show values ranging from 0.3 to 0.6 percent. The vitamin is easily separated from the gums and other substances present in press juice.

[III.] Indian gooseberry (*Phyllanthus emblica*), M. Srinivasan.—This fruit, known in Hindi as amla, is another rich source of vitamin C. According to data obtained in the author's laboratory and by other workers, the values may range from 290 to 921 mg. percent in the fruit or juice. Due to some inherent mechanism capable of protecting ascorbic acid from oxidation, the vitamin remains largely intact even in the desiccated fruit.

[Ascorbic acid in South Dakota's fruits and vegetables] (*South Dakota Sta. Rpt.* 1944, pp. 35-36).—A number of vegetables including snap beans, spinach, and kale, analyzed for ascorbic acid when freshly harvested and again after from 1-5 days storage in a refrigerator at about 40° F., showed a rapid and progressive loss of ascorbic acid during storage. Kale harvested at different dates in the summer showed a decrease in ascorbic acid as the plant matured. Various samples of rose hips from native South Dakota roses contained from 495 to 1,226 mg. ascorbic acid per 100 gm. flesh.

**Sampling of cooked cabbage in nutrition surveys,** H. G. BRAY and W. V. THORPE (*Nature [London]*, 154 (1944), No. 3916, p. 638, illus. 1).—In attempting to assay the ascorbic acid content of cooked cabbage and estimate the loss occurring in the time interval (30-60 min.) between cooking and consumption, the authors were unable to obtain reproducible results. When samples were minced or finely chopped no difficulty was encountered, but when samples were taken in the normal state—as actually served on the plates—fluctuation in duplicate values as much as  $\pm$  70 percent from the mean was observed.

Tests show rutabaga has high value as source of vitamin C, A. BLESTER (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 2 (1945), No. 3, p. 14).—Rutabagas, a satisfactory cool weather crop, are recommended as one of the "must" vegetables for regions where they can be grown, first, because they store satisfactorily without undue effort and thus do not compete for time with the last canning and pickling of the season, and, second, because they are an important source of vitamin C. In a study of 11 varieties grown at the station ascorbic acid values ranged from 29 mg. per 100 gm. (about 3.5 oz.) for the Laurentian variety to 62 mg. per 100 gm. for the Wilhelmsburger variety. It is pointed out that a medium-sized serving of rutabagas would provide a considerable part of the day's need for ascorbic acid (75 mg. per adult) even if only a half or two-thirds were retained in cooking.

**Variation of ascorbic acid in tomatoes,** E. G. HALLSWORTH and V. M. LEWIS (*Nature [London]*, 154 (1944), No. 3909, pp. 431-432, illus. 1).—Variations in ascorbic acid were found to be as great as 100 percent (24-51 mg. per 100 gm.) in any one variety grown in one plot. There was a marked bush-to-bush variation, while the fruits of one bush showed a certain consistency in all the fruits ripe at the same time. The ascorbic acid tended to be higher as the plant aged. The most striking result was the great correlation between fruit size and ascorbic acid content. In the fruits weighing 30 gm. or less, a correlation coefficient of -0.94 was obtained, showing that the smaller the fruit the higher the ascorbic acid.

The authors assume that the synthesis of ascorbic acid is markedly affected by light rays, and that a wide surface area/weight ratio is responsible for the higher values in the smaller fruits.

**The effect of ripening, storage, and other methods of handling on vitamin C in apples** (*Iowa Sta. Rpt.* 1944, pt. I, pp. 216-217, illus. 1).—This preliminary report of a study of vitamin C in Jonathan and Willowtwig apples indicates that the ascorbic acid concentration in apples is related to variety. Thus, on the day of picking, Jonathan apples contained 9.3 mg. per 100 gm. while Willowtwig apples contained 23.2 mg. In cold storage the Jonathan apples lost ascorbic acid, which decreased to a level of 4.3 mg. percent after 3 mo., but remained approximately the same for the next 4 mo. The level of ascorbic acid increased in the Willowtwig apples during the first month of storage, and the concentration was maintained for 7 mo.

**La vitamine P, recherches physiologiques** [Physiological investigations of vitamin P], J.-L. PARROT (*Compt. Rend. Soc. Biol. [Paris]*, 137 (1943), No. 5-6, pp. 171-172).—Catechin (3, 5, 7, 3', 4'-pentahydroxyphenylbenzo- $\gamma$ -pyrane) was found to possess high vitamin P activity measured by raised capillary resistance

in the scorbutic guinea pig. It was also found to prolong the action of adrenalin on the nictitating membrane of the anesthetized cat, being active in concentrations of 0.1 mg. per kilogram of body weight. The flavone derivative quercitroside, while inhibiting the autoxidation of adrenalin *in vitro*, did not possess this property when tested *in vivo* on cats. Scorbutic guinea pigs, which did not respond by any changes in capillary fragility to doses of 32 mg. ascorbic acid injected intraperitoneally, showed a marked elevation of capillary resistance (from 8 to as much as 26 cm. mercury) following a single intraperitoneal injection of 2 mg. catechin. Similar response was obtained when oral feeding was used.

## TEXTILES AND CLOTHING

**Pattern alteration, M. SMITH (U. S. Dept. Agr., Farmers' Bul. 1968 (1945), pp. 40, illus. 46).**—This publication, dealing with the problems of altering a pattern, gives step-by-step instructions on how to measure the figure, take corresponding pattern measurements, and alter the pattern pieces to correspond to the individual's measurements. The instructions are pointed up with pictures and line drawings well correlated with the text.

## HOME MANAGEMENT AND EQUIPMENT

**Increase in prices of goods for farm family living greatest in the South, D. DICKENS (Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 5, pp. 1, 8).**—A study of index numbers of prices paid by farm families for commodities used for family living in the base year 1910-14 as compared with those for the 1935-39 prewar period, and with prices paid in December 1943 and December 1944, showed indices of 100, 123, and 182 for family maintenance in the three periods, respectively. The increase in prices paid was not the same for all kinds of commodities for family maintenance, the increase in clothing prices, for example, being greater than that for food. In an analysis of the farm family living situation as compared with that of the city family it is pointed out that "since cash incomes of farmers on the average are lower than of city wage earners and clerical workers, they live more frugally. This means they generally buy lower priced commodities. When prices are rising, as has been the situation during this war period, the relative increase in prices of low price lines such as purchased by many farm families is greater than for the medium quality lines bought by many city wage earner and clerical families. This tendency, along with the leveling influence of price ceilings and the disappearance of many low-quality lines from the retailers' shelves, has undoubtedly resulted in greater rises in prices of commodities used by farm families than used by city wage earner and clerical families." This analysis suggests that "the rise in price of commodities used for family living has probably been greater for the Southern farm group than for any other group in our Nation."

**First aid for flooded homes and farms (U. S. Dept. Agr., 1945, rev., pp. 19).**—This publication, prepared to assist those who are returning to homes and farms that have been flooded, deals largely with the basic principles involved in the cleaning and salvaging operations. A warning is given as to the dangers of entering the flooded home, and this is followed by consideration of the problems of cleaning (1) heat, light and water supply systems of the home; (2) the house proper, including floors, woodwork, doors, walls, and wallpaper, and roofs; and (3) furniture and books. Further information involving the home is concerned with the saving and cleaning of foods (of which only undamaged hermetically sealed packages are safe to keep), clothing, bedding, rugs, and upholstery. On the farm, problems to be considered include disposal of dead livestock, salvaging of

feeds where possible, cleaning and reconditioning of farm machinery equipment, and the cleaning of ditches and drains. Finally, emphasis is placed on the importance of insect control, for which effective measures are outlined.

## REPORTS AND PROCEEDINGS

Annual report of the director [of Delaware Station], 1944, G. L. SCHUSTER (*Delaware Sta. Bul. 251 (1944)*, pp. 46, illus. 2).—In addition to a note abstracted on page 392 in this issue, a brief report is made of progress results of projects in agricultural economics, including factors affecting the wartime agricultural capacity of Delaware; agronomy, including variety and strain tests of wheat, grasses hybrid corn, barley, and oats, green forage production of clover and lespedezas, fertilizer placement for soybeans, green manures, and top-dressing wheat and alfalfa; animal husbandry, including strain improvement in poultry breeds, dehydrated vegetable wastes as poultry feeds, effect of poultry management methods on fertility and hatchability, comparison of various ranges for pullets, emergency war rations and protein concentrates for poultry, dead poultry and incubator eggs as a feed for hogs, floor space and litters in broiler houses, starting rations for broilers, and sulfaguanidine and epsom salts for control of coccidiosis; chemistry, including copper content and fertility levels of Delaware soils, and factors inducing jellying of pectin; entomology, including studies of the European corn borer, mosquitoes, peach-tree borer control, bean and cucurbit insects, Japanese beetle control, and insects of the year; horticulture, including variety tests of sweet corn, tomatoes, muskmelons, watermelons, squash, cucumber, sweetpotatoes, peaches (pollination and ripening dates), fertilizer studies with tomatoes, muskmelons, and strawberries (poultry manure), and cultural tests with tomatoes, watermelons (fruit thinning), and apples; and plant pathology, including chemical treatment of roots of sweetpotato sprouts, strawberry resistance to red stele, leaf blights of corn, control of soybean and lima bean diseases, effect of supplementary materials on fungicides, evaluation of new spraying equipment and methods, spray materials and dusts, and organic chemicals as fungicides.

Report on agricultural research [of Iowa Station] for the year ending June 30, 1944, I, II, R. E. BUCHANAN ET AL. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1944*, pts. 1, pp. 298, illus. 49; 2, pp. 92, illus. 16).—In addition to the usual administrative data and two items abstracted on pages 507 and 520 in this issue, part 1 contains special reports on the statistical section research program, by G. W. Snedecor, and Thirty Years of Soil Survey Progress at the Iowa Station, by W. H. Pierre and F. F. Riecken. The main portion consists of project reports on the work of the year as carried on in the sections of agricultural engineering, including farm building losses due to wind and fire, atmospheric exposure tests of wire and fencing, utilization of shredded cornstalks for farm building insulation, use of steel in barn building construction, farm fence construction, mulch culture for row crops, development of a machine for turning hemp windrows, adaptation of farm buildings to new uses, and a roller and vegetable planter for peat land; agronomy, including varietal response to cultural methods with oats, wheat, and barley, sweetclover strains, time of cutting clovers, soybean varieties, flax production methods, improvement of bromegrass, oats, barley, wheat, orchard grass, birdsfoot trefoil, and wild-rye, grass and legume species for soil conservation, hemp culture and improvement, pasture establishment and improvement, development of improved lespedeza, clovers, alfalfa, and Kentucky bluegrass, effect of hail damage on soybeans, soil microstructure, availability of soil phosphorus and potassium, characteristics and production capacities of Iowa soil types, nutrient deficiencies of soils, effect of cultural practices on composition and moisture in soils, crop rotations, land-use recommendations, soybean production in relation to fertilizers, nitrogen fixation and crop sequence, effect

of clover crops, soil contouring, and crop residues on soils and crop yields, retting of hemp, wartime needs for agricultural lime, and crop damage from inadequate drainage; animal husbandry, including inbreeding in Holstein cattle, Poland-China hogs, and other pure breeds of livestock, and the persistency and inheritance of milk and fat production, chemosterol, delsterol, and cod-liver oil as antirachitics for poultry, chemical relationships between food ingested and softness of the body fat, production of eggs rich in vitamin D, vitamin E content of livestock and poultry feeds, production of cholesterol from wool grease, evaluation of swine breeding stock, growth and development of colts, brucellosis in swine, effect of soybean products on milk production and fat quality, physiology of fore stomach digestion in calves, preservative effect of CO<sub>2</sub> on meat products in storage, effect of ration and fattening period on market poultry, association of so-called non-specific enteritis of chickens with fowl leukosis, mode of inheritance of leukosis resistance and transmission of the iritis type, recovery of byproducts from poultry wastes, wheat-germ oil as a supplement in poultry rations, microbiology of frozen eggs, properties of reconstituted dried eggs, feathers as raw material for new products, and construction of baled straw poultry house; bacteriology, including CO<sub>2</sub> in bacterial metabolism, conditions for optimal yields of 2,3-butylene glycol, and mechanism of vitamin action in micro-organisms; botany and plant pathology, including breeding resistant strains of melons, parasitism of oat diseases, propagation of disease-free sweetpotato stock, onion diseases, ecology of plants in waterfowl breeding areas, influence of pythiaceous fungi on seedling legumes and other crops, sugar beet production and storage, hill culture of milkweed, grapes, plums, grasses, and other cover crops, potato seedstocks and hybrids for disease resistance, control of black stem rust of wheat, rubber production from *Asclepias syriaca* and *A. sullivantii*, control of potato scab, seed disinfectants for diseases caused by soil-inhabiting fungi, sumac as a tannin or hill-culture crop, and control of oakwilt fungus and bromegrass diseases; dairy industry, including organisms important in dairy products, butter cultures from mixtures of organisms, acetyl methylcarbinol and diacetyl in butter cultures, acids in butter, dissimilation of carbon sources in butter and cheese cultures, ripening of hard cheeses, butterfat losses in Iowa creameries, effect of pH of serum of sweet cream butter on keeping quality, and vitamin A and beta-carotene contents of Iowa butter; entomology and zoology, including influence of meteorological factors on honey production, insecticides for potato leafhoppers, seasonal and host records for *Dermacentor variabilis*, *Grapholita packardi* Tel. as a new apple pest, quail and pheasant management, ecology of the muskrat, resistance to American foulbrood in bees, cottontail rabbits, infections of rabbits with *Escherichia* sp., control of nonmigratory grasshoppers, survey of Iowa fishes, and control of the sweetclover weevil; forestry, including control of white pine blister rust and amounts and grades of lumber from central hardwoods; genetics, including breeding for resistance to fowl typhoid, and to typhoid-like diseases in laboratory animals, radiation effect on genes, bacteria, and viruses, polyploidy in tomatoes, and heterosis in *Drosophila*; home economics, including toxemic pregnancies and pregnancy disorders induced by the feeding of pork diets, vitamin stores in college women, effect of processing on biological value of eggs, metabolism of Ca, N, and P in women in the fifth and sixth decades, and protection from degradation of cellulose-acetate rayon by chromic oxide; horticulture, including maintenance of fine turf grasses, rose variety tests, response of stocks to Iowa soil types, soil-less culture of roses and snapdragon, developing stocks for apples, soil management for apples, apple varieties, breeding plums, peaches (for hardiness) black raspberries (for anthracnose resistance), and rose stocks, freezing preservations of fruits and vegetables, storage of fruits in artificial atmospheres, placement of apple trees on terraces, home dehydration of fruits and vegetables, potato, canning pumpkin, and onion breeding, shrinkage of sweetpotatoes in storage, fertilizers for sweetpotatoes, direct seeding of tomatoes,

new varieties of sweetpotatoes and melons, cultural and irrigation tests with sweetpotatoes, melons, and potatoes, and vegetable production on muck and peat soils; rural social science, including adjusting transportation to wartime needs in livestock marketing, wartime shifts in farm management, rural school reorganization, and farm auction sales; and statistics, including investigations of methods for handling experiment station data technics suitable for a partial census, and sampling methods for yield determinations in experimental plots.

Part 2 is the ninth annual report of the Iowa Corn Research Institute. Following a report on The Values of Hybrid Corn to the Iowa Farmer, by G. F. Sprague, reports are given on soils and soil management as related to corn production; cultural methods and equipment for corn production, curing, and storage; corn breeding; botany of corn; diseases and insects; corn composition; industrial utilization; corn and corn products in human and animal nutrition; and economic phases of corn production and utilization.

Agricultural research in South Dakota: Fifty-seventh annual report [of South Dakota Station, 1944], I. B. JOHNSON ET AL. (Partly coop. U. S. D. A.). (*South Dakota Sta. Rpt. 1944*, pp. 48+, illus. 5)—In addition to an item abstracted on page 520 of this issue, progress notes are presented of research results in soils and crops, including the return of crop residues, long-time effect of cropping and fertilizers, Vikota oats, hybrid corns, breeding low HCN sorghums, sorghum storage, Kochia as a hay crop, strains and varieties of crested wheatgrass, soybeans, and potatoes (scab resistance), *Apameomyces cochlioides* on sugar beet roots, seed treatment of milo, tomato leaf spot, *Hyoscyamus niger* culture, and high feeding value of early cut hay; livestock production, including sweetclover silage for fattening calves, lambing off corn and sorghum, sorghum fodder for wintering breeding ewes, fattening fall pigs on grain, sorghums, and barley, bred v. open sows, and breeding of no-tail sheep; livestock diseases, including bloat in dairy cattle, selenium poisoning, sheep parasites, and cornstalk disease of cattle; poultry production, including hatchability of chicken and turkey eggs, dried distillers' grains for poultry, and soybeans in turkey rations; fruits and vegetables, including fruit variety tests, tomato cultural, fertilizer, and variety tests, hybrid sweet corn, cultural tests with vegetables, and false indigo (*Amorpha fruticosa*) as an insecticide; and at the substations in wintering, summer grazing, and breeding of range beef cows, planting corn and sorghum in alternate rows, and lamb and swine feeding; crop insects, including grasshoppers and blister beetle control; farm engineering, including adapting horse-drawn machines to power, hard-surfaced floors, earth walls for buildings, steel fence post coverings, and soybean harvesting and threshing machinery; home economics, including serviceability tests of serge clothing; farm income and community welfare, including relation of efficiency to farm earnings and adjustments to war and postwar needs; growth of kok-saghyz; seed-flax variety tests; value of contour farming and terraces in South Dakota, subsurface tillage and plowing; decrease by straw and stubble of soil blowing; and crested wheatgrass for bindweed control.

Twenty-fifth annual report [of the State of California Department of Agriculture] (*Calif. Dept. Agr. Bul.*, 33 (1944), No. 4, pp. 211-429+).—Progress reports are given on the activities of the divisions of plant industry, including the bureaus of entomology and plant quarantine, plant pathology, rodent and weed control and seed inspection, field crops, and chemistry; animal industry, including the bureaus of livestock disease control (with notes on malignant edema and jaundice in cattle and losses attributed to molybdenum poisoning), dairy service, livestock identification, and meat inspection; and economics, including the bureaus of markets and allied activities, agricultural statistics, fruit and vegetable standardization, shipping point inspection, and weights and measures.

General report on the implementation of the resolutions of the Second Inter-American Conference on Agriculture, submitted to the Third Inter-American Conference of Agriculture by the Pan American Union, Caracas, Venezuela, July 24, 1945 (*Washington, D. C.: Pan American Union, [1945], pts 1, pp. 89; 2, pp. 93, Span. ed., pp. 121; 3, Span. ed., pp. 116*).—These volumes of the report contain material submitted to the Pan American Union in response to a resolution adopted by the Second Inter-American Conference of Agriculture recommending an annual report by the Governments of the American Republics as to the fulfillments they have given to the resolutions of that conference. On the basis of this data, part 1 was prepared by the Union for Argentina, Colombia, El Salvador, Peru, and Venezuela; part 2 for Cuba, Haiti, Mexico, and the United States; and part 3 for Brazil and the Dominican Republic, as well as including reports from the Pan American Union and the Inter-American Institute of Agricultural Sciences.

[Eighth International Congress of Tropical and Subtropical Agriculture, 1939, I, II] (*8. Congresso Internazionale di Agricoltura Tropicale e Subtropicale, Tripoli, 1939. Roma: Fed. Internaz. Tec. Agr., 1941, vols. 1, pp. 143+; 2, pp. 814*).—Volume 1 of this Congress, held in Tripoli from March 13-17, 1939, deals with its organization and a summary of proceedings. Volume 2 is devoted to the detailed proceedings in the section on agricultural improvement in tropical and subtropical countries.

## MISCELLANEOUS

Science, the endless frontier: A report to the President, V. BUSH (*Washington: [U. S.] Off. Sci. Res. and Dev'lmt., 1945, pp. 184*).—This report to the President on a program for postwar scientific research considers such matters as Government relations to science, the war against disease, science and the public welfare, renewal of scientific talent, the problem of scientific reconversion, and the proposed National Research Foundation.

Microbial metabolism and agriculture, R. E. BUCHANAN. (Iowa State Col.). (*Science, 101 (1945), No. 2623, pp. 341-346*).—This address is designed to point out certain relationships between fundamental studies on microbial metabolism and the great basic science and art of agriculture, and asserts that these advances in physiology, enzymology, and physiological chemistry are significant not only in terms of human nutrition and physiology and curative and preventive medicine but also in farm production.

The Aleutian Islands: Their people and natural history (with keys for the identification of the birds and plants), H. B. COLLINS, JR., A. H. CLARK, and E. H. WALKER (*Smithson. Inst., War Background Studies, No. 21 (1945), pp. 131+, illus. 48*).—The following papers are included: The islands and their people, by Collins (pp. 1-30); animal life of the Aleutian Islands, by Clark (pp. 31-61); and plants of the Aleutian Islands, by Walker (pp. 63-74). Appendixes present lists of mammals and birds, with keys to the latter, and a systematic list of plants, with keys to the more common ones. A three-page bibliography is included.

Notes on analysis of experiments replicated in time, H. G. WILM. (U. S. D. A.). (*Biometrics Bul., 1 (1945), No. 2, pp. 16-20*).—In experiments designed to test the effects of various treatments on some factor such as crop yield, the

investigator may find it desirable to repeat his studies for several years on the same area to determine whether changes in climate or other factors which vary with time may exert any real influence on the general effect of the treatments under scrutiny. In field application this is an easy process but analysis of the results is not so simple. Since the general principles of this kind of analysis have not been generally available to American investigators it seemed desirable to the author to present his interpretation of these principles and an outline of the appropriate analytical method. As a typical example he considers a randomized block design containing four blocks of five plots with five treatments assigned at random to the plots within each block. The treatments were repeated without rerandomization on the same plots over a series of 3 yr.; the experiments had to do with soil moisture deficits as affected by timber cutting.

**Statistics in experimental work**, R. E. Comstock (*Res. and Farming [North Carolina Sta.]*, 3 (1945), *Prog. Rpt.* 3, pp. 2, 4).—A brief popular explanation of how statistics may be utilized in the interpretation and drawing of conclusions from experimental work.

**Mississippi Farm Research [April-May 1945]** (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), Nos. 4, pp. 8, illus. 2; 5, pp. 8, illus. 15).—In addition to articles noted elsewhere in this issue and weather notes, No. 4 contains The National Livestock Situation, by D. W. Parvin (pp. 1, 2); and Cotton Varieties in the Yazoo-Mississippi Delta, by J. W. Neely and S. G. Brain (pp. 4-5), also to be published as a station bulletin. No. 5 contains Danger Signals in Current Cotton Situation Caution on Part of Growers, by F. S. Welch and D. G. Miley (pp. 1-2); Sweet-potato Plant Production in Mississippi, by W. S. Anderson (pp. 3-6), also to be published as a station bulletin; and Livestock, Feed Grains, at High Level in April, by D. G. Miley (p. 8).

**Farm Research [April 1945]** (*Res. and Farming [North Carolina Sta.]*, 3 (1945), *Prog. Rpt.* 3, pp. 12, illus. 10).—In addition to articles noted elsewhere in this issue, this number contains From Research to Action Program, by D. F. Holler (pp. 9, 11), which gives examples of recently applied research; and Plants Poisonous to Livestock, by J. E. Foster (pp. 10, 11-12), a popular article based largely on Bulletin 342 (E. S. R., 90, p. 391).

**Bimonthly Bulletin [March-April 1945]** (*North Dakota Sta. Bimo. Bul.*, 8 (1945), No. 4, pp. 31, illus. 5).—In addition to articles noted elsewhere in this issue, this number contains Veterinary Science at Work for North Dakota Livestock Producers, by H. L. Walster (pp. 22-24), an account of the station organization and projects in this field; and North Dakota Farm Prices, by P. V. Hemphill (pp. 25-26), extending the index to February 15, 1945.

**Abstracts of new publications and list of publications available** (*Oklahoma Sta., What's New in Okla. Farm Res.* No. 8 (1944), pp. 11+; No. 9 (1945), pp. 15+).—No. 8 covers Bulletins 276-281, Circular 115, and Mimeographed Publications 107-127; No. 9 Bulletins 282 and 283, Circulars 116-118, and Mimeographed Publications 128-134. Lists of publications currently available in each case are appended.

## NOTES

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**Arkansas University and Station.**—Dr. C. O. Brannen has resigned as head of the department of rural economics and sociology, and was succeeded on July 1 by Dr. Trimble R. Hedges, professor of rural economics and sociology, who has been on military leave. B. F. Lucas and George W. Abel have resigned as forest economists, and Zilpha C. Battey as assistant professor of home economics.

**Colorado College and Station.**—Dr. Flora L. Slocum of the U. S. Social Security Board has been appointed dean of the division of home economics vice Inga M. K. Allison, retired after a pioneer service which began in 1908. Dr. Elizabeth Dyar has been appointed vice dean of home economics. Dr. Robert Kunkel has been appointed professor of horticulture and horticulturist vice Dr. John G. McLean.

**Georgia Station.**—Recent appointments include Paul Jones Mitchell and Dr. H. W. E. Larson (the latter previously extension soils specialist at the Idaho University) as associate chemists and Ethyl Shelor as assistant food technologist.

**Idaho University.**—Members of the Inland Empire Aberdeen-Angus Association, composed of breeders in Oregon, Washington, and Idaho, have given the university \$2,500 with which to purchase foundation animals to establish a herd of this breed.

A 4-year course in sugar beet technology is being offered for the first time, covering both the growing of the beets and producing sugar in the factory, and with its objective the providing of technically trained men. Close cooperation with the sugar beet industry is contemplated, including the part-time employment of students during the harvesting and sugar-making seasons.

**Louisiana University.**—Under an act signed by President Truman on July 14 the Secretary of Agriculture is directed, upon the consent of the Louisiana Rural Rehabilitation Corporation, to transfer to the university a tract of 3,113 acres located near Alexandria in Rapides Parish and known as the Boeuf Bayou farms project of the U. S. D. A. Farm Security Administration. This tract is to be used for the establishment and maintenance of an agricultural and vocational school. Announcement has been made that the State of Louisiana has \$400,000 immediately available for developmental purposes.

**Michigan College and Station.**—Arthur W. Farrall has been appointed head of the department of agricultural engineering.

**Mississippi College and Station.**—President George D. Humphrey has been appointed president of the University of Wyoming. Director Clarence Dorman of the station has been appointed acting president.

**Missouri University and Station.**—Dean and Director M. F. Miller retired from administrative work on August 31, when he was succeeded by E. A. Trowbridge, chairman of the department of animal husbandry.

**New Jersey Stations.**—Louis A. Voorhees, chemist in the stations from 1886 until 1895 and then chief chemist until 1905, died August 14 at the age of 80 years. After leaving the stations he was for many years city chemist of New Brunswick, of which city he was a lifelong resident.

**New Mexico College and Station.**—Additional funds for enlarging the station research program were granted by the last legislature.

The retirement on July 1 of Dr. Fabian Garcia removed from the list of experiment station directors the current "dean of the corps." Dr. Garcia's services to the institution began on his graduation with its first class in 1894, and thus have extended over half a century. His original appointment was as assistant agronomist, changed in 1905 to horticulturist, and in 1913 he was also made director of the station. He has long been recognized as an authority on the horticultural and other specialized problems of the region, and has exercised a wide influence in its development.

Albert S. Curry, assistant to the director, has been appointed acting director, and J. V. Enzie horticulturist and professor of horticulture. Margery Sulire has been appointed editor.

**New York State Station.**—The State Postwar Planning Commission has approved the construction of a new building for entomology to cost \$410,000, a new food research building, and a central heating plant.

The divisions of bacteriology and chemistry have been merged into a new division of food science and technology, with Dr. E. H. Stotz as head, and a committee including Drs. G. J. Hücker, C. S. Pederson, and Z. I. Kertesz. Dr. A. J. Braun of the U. S. D. A. Bureau of Plant Industry, Soils, and Agricultural Engineering has been appointed assistant professor in plant pathology.

**Oklahoma College and Station.**—A pasture study in which fertilizer treatments (including use of legumes) will be correlated with yield of forage and its nutritive value, as shown by chemical analysis and weight gains of cattle, has been established on a 210-acre station near Coalgate. Soils, pasture, and livestock workers are cooperating on the project.

Anaplasmosis research under way in cooperation with the U. S. D. A. Bureau of Animal Industry is being expanded with the aid of a special State appropriation of \$100,000 for the fiscal biennium 1945-47. The research will center on development of preventive biologics.

Dr. A. E. Darlow, head of the department of animal husbandry, has been granted 6 months' leave of absence to serve with the Army's education program for troops in the European theater. J. C. Hillier, assistant professor of animal husbandry, has been appointed in charge of meats research vice J. A. Beall, resigned to enter private business.

**South Dakota College and Station.**—The legislature has appropriated \$100,000 for an agronomy seed house and greenhouses.

Dr. Philip L. Kelly, whose resignation as associate professor and associate in animal industry in the Arkansas University and Station has been noted, has been appointed head of the dairy department.

**Vermont University and Station.**—The resignations are noted of Dr. N. N. Allen, associate animal husbandman and dairy husbandman in the station and associate professor of dairy production, and D. E. Dunklee, assistant agronomist, the former to accept a position at the University of Wisconsin and the latter to engage in commercial work. E. M. Meader of the U. S. D. A. Bureau of Plant Industry, Soils, and Agricultural Engineering has been appointed assistant horticulturist in the station and assistant professor of horticulture.

# EXPERIMENT STATION RECORD

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## RECENT WORK IN AGRICULTURAL SCIENCE<sup>1</sup>

### AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**Survey of the chemical composition of cotton fibers, cottonseed, peanuts, and sweetpotatoes: A literature review,** J. D. GUTHRIE, C. L. HOFFPAUER, E. T. STLINER, and M. F. STANSBURY (*U. S. Dept. Agr., Bur. Agr. and Indus. Chem.*, 1944, *AIC-61*, pp. 86).—This is a survey from the Southern Regional Research Laboratory of available information on the chemical constituents of cotton fibers, cottonseed, peanuts, and sweetpotatoes as based on 67, 91, 92, and 73 literature references, respectively, for these commodities.

**Chemical composition of wheatgrass and its response to season** L. A. STODDART (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 2, pp. 5, 15, illus. 3).—The grass examined was the bunch wheatgrass *Agropyron spicatum*. Samples were composed of 40 bunches clipped 0.5 in above ground level and dried in the laboratory. Harvesting was begun in mid-April when growth is just starting and continued at 2-week intervals until mid-June when growth had ceased and animals had left for summer range. An additional sampling was made in mid-September, at which time animals begin to return to the foothill range.

The carbohydrate levels and relationships indicated rapid decline in digestibility and feeding value of wheat grass forage as the season progresses. Protein content was very high in early growth stages but, by fall, the protein was deficient for all grazing animals. Spring levels of protein are high enough to supply adequate quantity, even to young animals, during the normal spring grazing season. Phosphorus, "which is doubtless the mineral most likely to be lacking in Utah forages," is high in wheatgrass during the spring. The phosphorus content of wheatgrass reached levels of 0.19 in late spring and 0.17 in the fall, indicating phosphorus deficiency, especially for young animals, after the grass matures. Summer and fall grazing on foothill wheatgrass ranges would be likely to necessitate protein and phosphorus supplement for the most satisfactory results.

**Bacterial amylases—production on wheat bran,** L. D. BECKORD, E. KNEEN, and K. H. LEWIS. (*Indus. and Engin Chem.*, 37 (1945), No. 7, pp. 692-696, illus. 2).—Favorable growth and amylase production by an organism classified as *Bacillus subtilis* occurred on a medium consisting of autoclaved wheat bran moistened with dilute phosphate buffer. Concentration and age of inoculum had little effect on the enzyme production, nor did repeated serial transfers in a

<sup>1</sup> The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (*E. S. R.*, 87, p. 324).

fluid wheat bran medium enhance its formation. At 37° C., with a ratio of 1 part wheat bran to 2.5 parts liquid, maximum amylase production resulted after a 48-hr. incubation. Maximum amylase per unit of bran was produced with a ratio of 1 part bran to 1.75 parts liquid. Enzyme yields over the range of ratios employed indicated, however, that amylase production is regulated primarily by the concentration of nutrient. The amylase resulting from growth of the selected isolate had a starch dextrinization optimum at pH 7-7.6 and a starch saccharification optimum at pH 6.6-7. The amylase was most resistant to thermal inactivation at about pH 7; it possessed the characteristic ability—attributed to bacterial amylases—of degrading starch at high temperatures. Resistance to thermal inactivation was enhanced by the presence of Ca ions. Degradation of starch by amylase differed from that typical of commercial preparations. At equal starch-dextrinizing activity, it had an early saccharification rate below that of barley malt but much greater than that of malt  $\alpha$ -amylase or of commercial bacterial amylase. Postdextrinization saccharification was pronounced; conversion of starch to fermentable sugar was comparable to that given by malt. It is concluded that bacterial amylases vary widely in their starch-degrading properties from those producing a minimum of sugars to others giving a high degree of starch saccharification.

Determination of the nutritive value of the proteins of food products, H. H. MITCHELL (Univ. Ill.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 11, pp. 696-700).—A detailed discussion of the advantages and disadvantages of the three methods used in studying the nutritive value of proteins is made (37 references). Amino acid analysis alone is considered inadequate, as satisfactory methods of assay for all amino acids are still incomplete. This method also fails to take into account the relative digestibility of the protein or the effect of storage and heat processing upon the nutritive value. Rat growth studies, although relatively easy to handle and useful in comparing protein "quality," also have obvious disadvantages, as the amounts of other nutrients in the diet (fat in particular) will affect the total gain in body weight as well as the percentage protein in that gain. The nitrogen balance method is recommended as being most accurate and reliable, with the modification by Murlin et al. (E. S. R., 81, p. 306) satisfactory with humans. The reporting of protein value in terms of "net protein," a figure derived from the digestibility and biological values of the protein, is recommended.

Utilization of amino acid enantiomorphs by *Lactobacillus arabinosus* and *Lactobacillus casei*, J. L. STOKES and M. GUNNESS (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 715-716).—Following the assay procedures of Shankman et al. (E. S. R., 92, p. 4), *d*, *dl*, or *allo* forms of several amino acids were studied. Only the natural or *l* enantiomorph of threonine and methionine can be utilized by *L. arabinosus*, while the same holds true for *L. casei* with phenylalanine, tryptophan, arginine, and tyrosine. Within experimental error, either the *dl* form was 50 percent as potent as the *l* isomer, or the available *d* antipode had less than 0.3 per cent of the activity of the latter.

The determination of *p*-aminobenzoic acid by assay with *Clostridium acetobutylicum*, J. O. LAMPEN and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 153 (1944), No. 1, pp. 193-202, illus. 4).—The method, described in detail, is based upon the turbidimetric measurement of the growth of *C. acetobutylicum* strain S9 after 24 hr. in a chemically defined medium. The assay range is approximately 0.3 to 1.5  $\mu$ g. of *p*-aminobenzoic acid (PAB) per tube (10 cc.). The activity of compounds related to (PAB) is as previously reported (E. S. R., 90, p. 165). A detailed study on the liberation of (PAB) from liver (dry-powdered sample) by autolysis, enzyme hydrolysis, acid, and alkali is presented. The authors find that hydrolysis with trypsin, pepsin, papain, or takadiastase yields

values ranging from  $0.8\gamma$  to  $2.4\gamma$  per gram as compared to a value of 1.6 obtained by water extraction for 1 hr. at 15 lb. pressure. Various acid and alkali treatments using 1 to 5 N NaOH and 1 to 6 N HCl at 15 lb or 75-80 lb pressure for 1 to 24 hr. are described. At 15 lb pressure, highest values ( $4.4\gamma$ ) are obtained in 1 hr. using 2 N HCl. If hydrolysis continues longer than 1 hr. in acid solution, destruction of (PAB) occurs. Alkaline hydrolysis at 15 lb pressure is slower but gives higher final values: 5 N NaOH gave a maximum (PAB) of  $9.0\gamma$ - $9.5\gamma$  per gram after 8-12 hr. hydrolysis; alkaline hydrolysis at 75-80 lb. pressure gave maximum values (approximately  $11\gamma$  per gram) in 1 hr. with 5 N NaOH. (PAB) added before alkaline hydrolysis was recovered in amounts varying from 92 to 100 percent. The release of "bound" (PAB) from natural materials by acid and alkali treatment and the possible factors possessing (PAB) activity are discussed.

The microbiological determination of free choline in plasma and urine, R. W. LUECKE and P. B. PEARSON. (Tex Expt. Sta). (*Jour. Biol. Chem.*, 153 (1944), No. 1, pp. 259-263).—Experiments were carried out by the microbiological method of Horowitz and Beadle (E. S. R., 92, p. 8) using a "choline-less" mutant of *Neurospora crassa*. Preliminary tests showed little of the free choline in blood in the cells; therefore, plasma alone was studied in the later experiments. To remove the stimulatory effect produced by lecithin, which was approximately one-half that of free choline, plasma samples were treated with acetone. Methionine or other growth stimulants were removed from urine samples by permutite adsorption and elution. Experiments to determine the ability of these methods to remove interfering substances, gave expected recoveries, within the experimental error of the method. Free choline in human plasma ranged from  $44\gamma$  to  $75\gamma$  per cubic centimeter, being somewhat higher than the values obtained with horse, cow, and sheep plasma. Urinary choline was found to exist entirely in the free state. In four adults tested, the values ranged from 5.6 to 9.0 mg. per 24-hr. sample.

Determination of crude lipid in vegetable matter, J. P. NIELSEN and G. S. BOHART. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 11, pp. 701-703).—A rapid and relatively simple procedure is described, based upon the use of the Waring Blender for comminuting the sample, initial extraction in acetone, evaporation, subsequent solution in petroleum ether, and final weighing of the material obtained upon evaporation of this solvent. The method, considered satisfactory as applied to many vegetable materials, gives perceptibly higher values for crude lipides in immature seeds than does the usual Soxhlet extraction, while its application to hard oil seeds which might not be disintegrated by the recommended procedure, is discouraged. The residue remaining after Soxhlet extraction of corn or soybeans was subjected to the above procedure, and values were obtained which, when added to the Soxhlet extraction values, were substantially in agreement with the values obtained by this new proposed method. Analysis of this lipide fraction in the residue indicated that it might be some low-molecular weight, saturated acid, probably butyric acid.

A leucineless mutant strain of *Neurospora crassa*, D. C. REGNERY (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 151-160, illus. 3).—By applying the technics used by Beadle and Tatum (E. S. R., 88, p. 151) on the red bread mold *N. crassa*, a mutant was obtained by ultraviolet irradiation which required leucine for growth in an otherwise simple medium of inorganic salts, nitrate or ammonium nitrogen, a carbon source, and biotin. The final mutant used in the experiments was a leucineless-albino-1 (Strain 33757-4637).

Using the method of Horowitz and Beadle (E. S. R., 92, p. 8), which measures the dry weight of mycelium produced in liquid medium over a limited time interval, the author found that the leucineless strain responded specifically to leucine and its keto acid analog. Conidia of this strain failed to germinate and mycelia

failed to grow in the absence of leucine or  $\alpha$ -ketoisocaproic acid. Other amino acids and various other compounds related to leucine were inactive in inducing germination or growth. Leucic acid showed growth-promoting activity if growth was initiated by adding small amounts of *l*( $-$ )-leucine or its keto acid analog. Isovaleric acid, isovaleraldehyde, isoamyl alcohol, and *d*( $+$ )-leucine in the presence of *l*( $-$ )-leucine increased the weight over that of the *l*( $-$ )-leucine controls but by themselves would not initiate growth. Under standard conditions the dry weight of mycelium produced by the leucineless strain in liquid culture was approximately proportional to the leucine available. The weight-leucine relation was stable over rather wide variations in pH, temperature, salt concentration, and presence of various extraneous substances. It was, however, influenced by wide variations in the sucrose-leucine ratio. A leucineless mycelium, once growth was started, was capable of obtaining the leucine it required for further growth from certain peptides and proteins.

A method for the determination of leucine in protein hydrolysates and in foodstuffs by the use of a *Neurospora* mutant, F. J. RYAN and E. BRAND (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 161-175, *illus.* 1).—Employing the leucineless strain of *Neurospora* isolated by Regnery (as noted above), the authors describe in detail their microbiological assay method for leucine. A standard curve showing a linear relation between leucine content and dry mycelium weights ranging between 10 and 35 mg. was obtained. Occasional growth of the organism as if no *l*( $+$ )-leucine were needed resulted in certain limitations to the interpretation of results. As "adaptation" of the mutant could occur in a fair proportion of cases, values of 40 to 100 mg. of dry mycelium (which indicated early adaptation) were automatically discarded. The use of several levels of assay material in duplicate or triplicate was necessary to attempt to exclude any variations produced by mutants showing partial or late adaptation. Values which deviated from the combined mean of the several assays by more than twice the standard deviation were also excluded. A comparison of the microbiological method with other chemical or physical methods indicated good agreement.

The leucine content for the following substances is reported: Gelatin 3.6 percent, egg albumin 9.6, horse hemoglobin 15.7, crystalline insulin 13.4, skim milk powder 3.5, casein 9.8,  $\beta$ -lactoglobulin 15.4, dried yeast 2.9, wheat flour 0.8, and gliadin 6.5 percent. Tryptophan and tyrosine values for the last six substances are also reported.

Note on the gasometric determination of oxalic acid and calcium, J. SENDROY, JR. (*Jour. Biol. Chem.*, 152 (1944), No. 3, pp. 557-558).—The original method of Van Slyke and Sendroy<sup>3</sup> has been modified to increase its convenience and accuracy. The principal modifications include the use of paraffin instead of vaseline around the outer rim of the centrifuge tubes; the use of 5 cc. wash water instead of 4 cc., with a change in the total volume of liquid in the measuring chamber to 7 cc.; and the use of 5 drops of saturated  $Ce(SO_4)_2$  in 1 N  $H_2SO_4$  instead of 1 cc. of acidified 0.15 N  $KMnO_4$  in the gas chamber. Experiments with standard solutions showed that the yield of  $CO_2$  became practically theoretical. An increase in total fluid volume used from 7.0 to 7.2-7.3 cc. required an increase in the correction factor applied to unextracted  $CO_2$  of about 0.5 percent. Great emphasis is placed upon the thorough cleaning and washing of the extraction chamber between analyses.

Determination of serum calcium by precipitation with oxalate: A comparative study of factors affecting the results of several procedures, J. SENDROY, JR. (*Jour. Biol. Chem.*, 152 (1944), No. 3, pp. 539-556).—Using the gasometric procedure noted above, a detailed comparative study was made of the factors of analytical error involved in the precipitation of serum calcium as oxalate under

various conditions. "Analyses of known salt solutions and of serum, by direct precipitation, ashing, and deproteinization techniques, indicate the following as sources of error: Contamination by calcium from filter paper and reagents and by non-calcium oxalate in coprecipitation, the reducing action of serum in direct precipitation, and the fluid volume displacement of proteins in deproteinization. Together with an explanation of their origin, methods of eliminating these errors or of evaluating them accurately have been presented. The application of such corrections quantitatively reconciles the apparent discrepancies among the three methods. In these analyses, calcium oxalate may be precipitated at pH from 4.0 to 7.5. For both accuracy and simplicity, the technic of direct precipitation is, in most cases, the method of choice for the determination of serum calcium as oxalate."

The determination of iron in tissues, E. M. Scott (*Arch. Biochem.*, 6 (1945), No. 1, pp. 27-32, illus. 1).—The methods for total iron described are essentially those of the Association of Official Agricultural Chemists (E. S. R., 85, p. 5) and of Kennedy (E. S. R., 62, p. 789) adapted to small amounts of Fe and to the Beckman spectrophotometer. The samples are wet-ashed with a mixture of 60 percent  $\text{HClO}_4$  and concentrated  $\text{H}_2\text{SO}_4$ , the salts obtained upon digestion to dryness are dissolved in  $\text{HNO}_3$ , and the reaction with KSCN is carried out in the solution acidified with HCl. In the semimicromethod developed, the optical density is read immediately with the Beckman spectrophotometer at 10- $\mu\text{m}$  intervals from 540 to 450  $\mu\text{m}$ , and the readings are divided by the appropriate factors (tabulated) to give the amount of iron in the sample in micrograms. The method is applicable, with a precision of  $\pm 0.2 \mu\text{g}$ , to samples containing 0-70  $\mu\text{g}$ . Fe; 0.1 cc. blood, or 0.2 gm. liver are suitable samples for analysis. The micro-method suitable for as little as 0.01 cc. blood, 0.5 cc. blood serum, or 0.1 gm. muscle involves extraction of the color complex with isoamyl alcohol and spectrophotometric readings on the extract. With a range of 0-15  $\mu\text{g}$ . Fe, a precision of  $\pm 0.05 \mu\text{g}$ . is attained. In the adaptation for determining free Fe in tissue extracts, the tissue dispersed in water (in a glass grinder if necessary to form a fine suspension) is acidified with HCl and subjected to a triple ether extraction to remove hematin. Any emulsion is broken by centrifuging, and a portion of the extracted suspension is treated with KSCN and isoamyl alcohol, shaken, and recentrifuged. Readings made on the isoamyl alcohol extract from 540 to 450  $\mu\text{m}$  show the presence of a small amount of hematin. Correction for hematin may be made by measuring absorption at 410 to 380  $\mu\text{m}$  and applying the formula developed. The useful range is from 0 to 20  $\mu\text{g}$ ., but the precision is not better than  $\pm 5$  percent. Suitable samples are 0.025 cc. blood cells, 0.5 cc. blood serum, or 0.2 gm. liver.

A method for the colorimetric determination of potassium in biologic products, A. A. ALBANESE and D. L. WAGNER (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 3, pp. 280-284, illus. 1).—The method described is based upon the measurement of potassium as the green color produced by the basic carbonate of cobalt on transforming the insoluble potassium sodium cobaltinitrite into the respective chlorides of the complex cations and treatment of the mixture with bicarbonate. To tubes containing 1 or 2 cc. urine, or prepared tissue sample at pH 5 to 6 and a content of not more than 3 mg. potassium, are added 2 cc. of the sodium cobaltinitrite reagent and distilled water to give a final volume of 5 cc. After standing 2 hr. at room temperature, the mixture is centrifuged 10 min. at 3,000 r. p. m. and the supernatant solution discarded. The yellow precipitates are washed twice with 5 cc. of 30-percent ethanol by successive resuspension, centrifugation, and decantation. After thorough draining, 0.5 cc. 90-percent HCl is added to each tube, the precipitates dissolved, and the nitrogen oxide gases removed by heating over

a microburner. After cooling, 0.5 cc. of 3-percent  $H_2O_2$  is added, and a saturated solution of potassium bicarbonate is added dropwise until effervescence ceases. The samples are read in a Klett-Summerson photoelectric colorimeter, using the S-60 filter. Color intensity remains stable from 2 to 3 hr. As the color retention obeys Beer's law, the potassium content of a given sample can be estimated directly from a prepared calibration curve. Normal blood serum values (for children) ranged from 14.4 to 21.8 mg. per 100 cc., and the potassium content of adult human erythrocytes was found to be 0.44 percent. Urine values obtained from seven adults on a normal diet showed a daily potassium output varying from 2.92 to 4.76 gm.

Fluorophotometric analysis of vitamin A esters, H. SOBOTKA, S. KANN, and W. WINTERNITZ (*Jour. Biol. Chem.*, 152 (1944), No. 3, pp. 635-639, illus. 2).—The difference in the course of fluorescence during ultraviolet irradiation between vitamin A alcohol and vitamin A esters, previously reported by Sobotka et al. (E. S. R., 92, p. 7), has been utilized by the authors for the differential analysis of mixtures of these compounds. With the acetate, laurate, myristate, palmitate, and oleate esters of vitamin A, the course of the intensity of fluorescence was practically identical for equivalent concentrations. Vitamin A linoleate gave a similar reaction, but with a maximum fluorescence about 20 percent lower than the others, while vitamin A azobenzene carboxylate showed an entirely different curve. By comparing the total vitamin A present with the maximum fluorescence intensity obtained and plotting the results, an evaluation of the ester percentage was determined by a nomographic procedure. Correction for linoleic acid was necessary if present in appreciable amounts. The authors found the method applicable to rat liver, which is relatively low in carotene content. In blood serum the carotenoids present interfered with the reaction, and the application of the method here has not been found feasible. The ester percentages of a number of vitamin A preparations are given.

Identification of the fluorescent substance  $F_2$ , V. A. NAJJAR and V. WHITE (*Science*, 99 (1944), No. 2571, pp. 284-285).—In continuing the studies of Najjar et al. on the fluorescent compound  $F_2$ , obtained from urine eluates after treatment with alkali and butanol (E. S. R., 85, p. 702; 88, p. 712), the present article deals with the chemical changes concerned in the conversion of the nonfluorescent precursor and with the fluorescent compound  $F_2$ . Treatment of purified urinary eluate with alkali forms a fluorescent carbinol which, the authors presume, forms a condensation product with isobutanol (based on the observation that minute additions of isobutanol to the alkaline carbinol solution, insufficient to cause separation of an alcohol layer, causes a striking increase in fluorescence). The formation of the carbinol-ether is not instantaneous, but progresses upon standing. When the isobutanol extract is evaporated to dryness, the carbinol-ether is broken down, leaving the carbinol itself. From this and other experimental data given, the authors imply that, although the complete structure of the  $F_2$  precursor is not yet established, the highly fluorescent compound  $F_2$ , formed from this precursor on treatment with alkali and butanol appears to be a butyl ether of *N*-methyl-nicotinamide  $\alpha$ -carbinol.

$F_2$  and  $N^1$ -methylnicotinamide, J. W. HUFF and W. A. PERLZWEIG (*Science*, 100 (1944), No. 2585, pp. 28-29).—Polemics with Najjar and White, noted above, in regard to the nomenclature applied to the nicotinic acid metabolite occurring in urine, the authors propose "that only the fluorescent derivative in butanol obtained by extraction from strongly alkaline aqueous solutions be called  $F_2$ , and that its precursor, the physiological metabolite of nicotinic acid, be designated as the cation  $N^1$ -methylnicotinamide."

The structure and synthesis of pyridoxamine and pyridoxal, S. A. HARRIS, D. HEYL, and K. FOLKERS (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 315-316).—At the suggestion of Snell (p. 660), the authors succeeded in synthesizing two active derivatives of pyridoxine, namely, the amine, "pyridoxamine," (2-methyl-3-hydroxy-4-aminomethyl-5-hydroxymethylpyridine) and the aldehyde, "pyridoxal" (2-methyl-3-hydroxy-4-formyl-5-hydroxymethylpyridine). A brief description of the processes used is given.

Determination of pyridoxin and pseudopyridoxin, L. E. CARPENTER and F. M. STRONG. (Wis. Expt. Sta.). (*Arch. Biochem.*, 3 (1944), No. 3, pp. 375-388, illus. 3).—This detailed study was made to determine the specificity and accuracy of the various microbiological methods used for the assay of pyridoxine. The *Neurospora* assay of Beadle and Tatum (E. S. R., 88, p. 151) gave irregular growth curves, with the form of the mycelium often ill-defined and the results, therefore, difficult to interpret. The *Lactobacillus casei* method of Landy and Dicken (E. S. R., 90, p. 298) proved even more unsatisfactory, as pseudopyridoxine if formed or present provoked accelerated growth of the organism. The titration curve of *L. casei* was sharply affected by the first additions of pyridoxine (0.0125 to 0.05 µg. per tube) but leveled off rapidly with higher concentrations of B<sub>6</sub> (from 0.10 to 0.30 µg. per tube). Various modifications of the media produced no better results. Conversion of pyridoxine to pseudopyridoxine by various chemical treatments was studied. Hydrogen peroxide gave the best results, producing a sixfold response by the *L. casei* method. Sodium hydroxide, cystine, and cyanogen bromide treatments were effective but to a lesser degree (approximately twofold increased activity as measured by *L. casei*). The yeast assay method of Atkin et al. (E. S. R., 90, p. 9) was found to be unaffected by pseudopyridoxine and highly specific for pyridoxine. Out of 10 derivatives tested, only 2 (the diacetate and bis-bromomethyl derivatives) showed any appreciable activity, and these two compounds exhibit similar activity for the rat. Various cereals tested by yeast and rat growth gave comparable results. The authors conclude that "the yeast method appears to be the best microbiological assay procedure for pyridoxine available at the present time."

The use of diazotized p-aminoacetophenone in the determination of vitamin B<sub>6</sub> (pyridoxine), E. B. BROWN, A. F. BINA, and J. M. THOMAS (*Jour. Biol. Chem.*, 158 (1945), No. 2, pp. 455-461).—A new diazo reaction for the assay of pyridoxine is described in detail, and claimed to be more sensitive and specific than the authors' previously published method based on the use of diazotized sulfanilic acid at pH 10 to 11 (E. S. R., 90, p. 441). Pyridoxine is extracted from biological materials by the methods previously used. The filtered hydrolysate thus prepared is treated with a synthetic resin (Amberlite IR-4), which is said to remove compounds interfering with the color reaction more quickly and easily than the sodium tungstate formerly used. Experiments showed 96 to 100 percent recovery of added pyridoxine when the adsorption time did not exceed 5 min. The resin-free extract is then adsorbed on Super Filtral and selectively eluted with alkaline ethanol. The alcoholic solution of pyridoxine is adjusted to pH 7.3 with acetic acid. Water, sodium acetate, and the diazo reagent are respectively added to an aliquot of the above solution, and the yellow color, which reaches a maximum intensity in 3 to 5 min. after the addition of the diazo reagent, is measured in a Pfaltz-Bauer fluorophotometer, using a combination of blue and yellow filters with a maximum transmission at 420 mµ. A blank containing all reagents except pyridoxine is used to set the instrument at 0 extinction or 100 percent transmission. Attempts at substitutions in the method showed that zeolite, prepared as for use in thiamine analysis, could be used in place of Amberlite IR-4. Other alkaline alcohols tested were inferior to ethanol as an eluate. The addition of boric acid

produced interfering side reactions which prevented its use as a blank.

Results obtained by this new method were in good agreement with earlier data. However, the values found by both of the chemical methods were higher than those obtained by the biological method of Waisman and Elvehjem (E. S. R., 87, p. 11) or than values reported by others for similar materials (dried brewers' yeast, rice-bran concentrate, and whole-wheat flour) analyzed by other chemical methods.

The use of *Lactobacillus arabinosus* in the microbiological determination of pantothenic acid, H. R. SKEGGS and L. D. WRIGHT (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 21-26, illus. 1).—The original microbiological assay method for nicotinic acid, that of Snell and Wright (E. S. R., 87, p. 12), was modified to permit the use of *L. arabinosus* 17-5 for the determination of pantothenic acid. The modified procedure, described in detail, included the substitution of nicotinic acid for pantothenic acid in the original basal medium. Various substances assayed gave results in good agreement with values obtained by the other microbiological methods which use *L. casei* as the test organism (E. S. R., 85, p. 442; 90, p. 298). The authors consider their modification superior to the previously reported methods in the following respects: (1) It can be used accurately as an 18-hr. turbidimetric method, (2) low blanks are consistently obtained, and (3) the response to pantothenic acid is more specific.

Use of *Lactobacillus arabinosus* 17-5 for microassay of pantothenic acid, E. H. HOAG, H. P. SARETT, and V. H. CHELDELIN. (Oreg. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 17 (1945), No. 1, pp. 60-62, illus. 2).—Using a basal medium essentially that of Pennington et al. (E. S. R., 85, p. 442), the authors found that *L. arabinosus* can effectively replace *L. casei* as the test organism, with the advantage of producing sufficient growth to permit turbidity reading after 14 hours' incubation, or titration values after only 24 to 30 hours' incubation at 37° C. The "downdrift" observed at higher assay levels with extracts of certain natural materials was overcome by additional changes in the basal medium, so that the final composition per 100 cc. medium became as follows: Alkali-treated peptone (plus sodium acetate) 1.0 gm.; glucose 4.0 gm.; sodium acetate 2.4 gm.; acid-hydrolyzed casein 0.4 gm.; autolyzed yeast, norite-treated, 0.2 gm.; rice bran concentrate (Vitab), norite-treated, 1.5 gm.; cystine hydrochloride 20 mg.; riboflavin 20 µg.; and salts A and B (Pennington et al.) 1.0 cc. each. With the exception of certain high-fat materials, it was not necessary to filter or ether extract the samples after the usual preparation, which consisted of enzymatic digestion by takadiastase and papain at 37° for 24 hr., followed by 30 min. steaming. Assays on various products, including ham, peanut butter, rolls, sausage, yeast extracts, breakfast cereals, and other foods, showed good agreement with previously reported values by the *L. casei* method.

Standard solutions for the estimation of riboflavin, S. W. F. HANSON and A. F. WEISS (*Analyst*, 70 (1945), No. 827, p. 48).—Difficulty in reproducing calibration curves in the fluorometric determination of riboflavin, using pure riboflavin solutions, led the authors to investigate the solubility and corresponding fluorescence of varying concentrations of riboflavin solutions. Concentrations of riboflavin (in distilled water) of approximately 8, 16, 32, 64, 128, and 256 p. p. m. were accurately weighed, diluted to volume, and shaken for 2 min. twice each day for 7 days, being kept in a dark cupboard at a temperature of 16°-21° C. during the process. Results showed a straight line relationship between concentration and fluorescence up to 32 p. p. m., but the authors concluded that above 30 p. p. m. this might not hold true and might result in misinterpretation of the data.

**A simple modification of the colorimetric method for routine thiamine clearance tests, M. HOCHBERG and D. MELNICK (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 53-59, illus. 1).**—By the simple expedient of testing a 1-hr. urine aliquot, a rapid and convenient modification of the original Melnick and Field colorimetric method for the determination of thiamine (E. S. R., 83, p. 731) has been created. The benzyl alcohol extraction step for the quantitative and selective removal of thiamine from the concentrated urine has been found unnecessary, as the amount of salt and other materials in a 1-hr. aliquot are not sufficient to interfere with the adsorption of thiamine on the zeolite column. The precaution of maintaining an inert atmosphere during the adsorption and elution of the vitamin is no longer essential. A detailed description of the method is presented. "The procedure involves direct adsorption of the vitamin from a 1-hr. urine sample on a simplified zeolite column, its elution and coupling with diazotized *p*-aminoacetophenone, and finally extraction and measurement of the pigment formed. The results obtained by the abridged method in testing urine samples varying widely in thiamine content compared favorably with those yielded by the original procedure."

**An improved thiochrome method for the determination of thiamine in urine, V. A. NAJJAR and K. C. KETRON (*Jour. Biol. Chem.*, 152 (1944), No. 3, pp. 579-584, illus. 1).**—The nicotinic acid derivative F<sub>2</sub> discovered by Najjar and Wood (E. S. R., 85, p. 702) has been found to interfere with the thiochrome method of Hemesssy and Cerecedo (E. S. R., 82, p. 588) as applied to the determination of thiamine in urine and certain other substances. The fluorescence produced by F<sub>2</sub> in the presence of ferricyanide is only 21 percent of that produced with alkali alone. Based upon this linear relationship which exists between the fluorescence of reduced F<sub>2</sub> and oxidized F<sub>2</sub> at concentrations smaller than four Najjar-Wood units, a correction factor has been established which is applicable to the thiamine determination. If the fluorescence of the alkali-treated aliquot is designated as *A*, that of an aliquot treated with alkali plus ferricyanide as *AF*, and that of the reagent blank as *B*, the fluorescence of thiochrome in the aliquot can be represented by the expression  $(AF - B) - 0.21(A - B)$ . Tests with thiamine-free urine samples to which known amounts of both thiamine or F<sub>2</sub> are added have shown excellent recovery values when calculated by this method.

**A modification of the thiochrome method for the rapid determination of thiamine in urine, W. A. PERLZWEIG, H. KAMIN, I. GUE, and J. V. BLALOCK (*Arch. Biochem.*, 6 (1945), No. 1, pp. 97-103).**—The method consists essentially of the following steps: Adsorption of the thiamine on superfiltrol, as described by Emmett et al. (E. S. R., 85, p. 727), elution with an acid pyridine-methanol solution (described in detail), and the oxidation, extraction, and fluorometric reading following the technic of Mason and Williams (E. S. R., 90, p. 12). The eluting solution is made up from Merck's Reagent pyridine, kept over charcoal, and filtered when needed. To 200 cc. are added 800 cc. of water and 200 to 210 cc. of concentrated HCl, adjusting the solution to approximately pH 1, followed by the addition of 600 cc. of Merck's Reagent methanol. The authors indicate that it is necessary that each sample of urine analyzed be calculated in terms of its own "blank" and "recovery" of added thiamine values, if reproducible values are to be obtained.

**The determination of dehydroascorbic acid and ascorbic acid in plant tissues by the 2,4-dinitrophenylhydrazine method, J. H. ROE and M. J. OESTERLING (*Jour. Biol. Chem.*, 152 (1944), No. 3, pp. 511-517).**—Based upon the previously described method of Roe and Kuether (E. S. R., 90, p. 297) for the determination of total vitamin C in blood and urine, the authors present a modification which is applicable to plant tissue and can measure dehydroascorbic acid alone, as well as total ascorbic acid. For dehydroascorbic acid assay alone, the tissue is ground

under 20 to 50 parts of a solution containing 5 percent metaphosphoric acid and 1 percent thiourea and filtered. The remainder of the treatment parallels that used in the original method: Addition of 2,4-dinitrophenylhydrazine in approximately 9 N H<sub>2</sub>SO<sub>4</sub>, incubation at 37° [C.] for 3 hr., cooling in ice water, addition of 85 percent H<sub>2</sub>SO<sub>4</sub>, and reading 30 to 45 min. after removal to room temperature. A blank for each tissue tested is made and appropriate standards are used for a calibration curve. The oxidation of the sample by norite is omitted. The purpose of the thiourea is to stabilize the ascorbic acid during extraction and subsequent treatment. Pure ascorbic acid in a concentration of 15γ per cubic centimeter, treated as described above, gives no color after 5 hours' coupling treatment at 37°. The assumption that no dehydroascorbic acid is formed from ascorbic acid in plant tissues by the same treatment is supported by the results obtained on various plant tissues tested. Comparison with the classical indophenol methods and the previously described method for total ascorbic acid shows good agreement when the amounts of dehydroascorbic acid present are taken into consideration.

Tests with the reducing compounds produced by prolonged heating of various sugars in acid or alkali media showed that the alkaline hydrolysis of glucose and dextrin did produce appreciable amounts of interfering compounds (reductones or enediol derivatives). The authors conclude that as most heating is carried out in neutral or slightly acid solutions, in which the production of interfering compounds is negligible, the interference is not serious in normal cooking processes. The method is considered highly sensitive. Concentrations of vitamin C in the tissue filtrate approximating 0.2 mg. ascorbic acid per 100 cc. filtrate are usually used, and the amount of tissue should not exceed 2 gm. per 100 cc. unless very small quantities of vitamin C are involved.

**Vitamin methods.—VI.** The estimation of ascorbic acid in the presence of reductones and allied substances, L. W. MAPSON (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 62 (1943), No. 12, pp. 223-232, illus. 6).—In continuation of previous work (E. S. R., 89, p. 626), the experimental data, which have been reported briefly elsewhere (E. S. R., 91, p. 228), are presented here in detailed graphic and tabulated form. The ascorbic acid content of several fresh fruits, fresh vegetables, cooked vegetables, preserved fruits, and dehydrated products is presented. Values obtained by the usual indophenol titration method and the described formaldehyde method are compared. The author concludes that fresh fruits, vegetables, and animal tissues, and some typical cooked and preserved foods may be adequately assayed for ascorbic acid by the indophenol titration method. Certain caramelized or fermented foods, and dehydrated foods which have been either processed or stored at high temperatures, contain substances resembling reductones, and the modified formaldehyde method described permits the estimation of ascorbic acid in the presence of these substances. Hydroxytetronic acid, a synthetic compound whose presence has not been noted in natural products, reacts similarly to ascorbic acid in the presence of formaldehyde.

The estimation of apparent vitamin-C in foods, F. WOKES, J. G. ORGAN, and F. C. JACOBY (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 62 (1943), No. 12, pp. 232-236, illus. 4).—A detailed and graphic presentation is given of the data briefly reported elsewhere (E. S. R., 91, p. 229). Following Mapson's suggestions (see above) on the modification of a formaldehyde method for the determination of ascorbic acid in the presence of interfering reducing substances, the authors have worked out a procedure which is effective at pH 4-5. Colored solutions do not interfere with the reaction, as the potentiometric method of Harris et al. (E. S. R., 89, p. 626) is used for determining the end point.

**Estimation of vitamin C in presence of iron salts: Stepwise determination of vitamin C and ferrous iron with dichlorophenolindophenol,** O. GAWRON and

R. BERG (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 12, p. 757).—It is observed in isolated vitamin C-iron salt systems that vitamin C can be determined in the presence of ferrous iron if acetic acid is employed as the titration medium, and in the presence of ferric iron if metaphosphoric acid is present in the medium. The observation that ferrous iron reduces dichlorophenolindophenol in the presence of metaphosphoric acid and that ferric iron oxidizes reduced dichlorophenolindophenol in acetic acid medium is the basis for the stepwise determination of vitamin C and ferrous iron in the same aliquot.

Adaptation of a Waring Blender for continuous emulsification, C. L. COMAR, E. J. MILLER, M. N. RICHARD, and E. J. BENNE. (*Mich. Expt. Sta.*). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 11, pp. 717-719, illus. 3).—Modification of the Waring Blender by changing the size and shape of the glass containers is described. Details and a diagram are given of a set-up which can produce large amounts of a stable wax emulsion by a continuous-flow process. The droplets thus produced are about 1μ. in diameter and fairly uniform as to size.

Proposed provisional method for testing the resistance of leather to the growth of fungi (*Jour. Amer. Leather Chem. Assoc.*, 40 (1945), No. 6, pp. 239-240).—This method—developed and described by the Physical Testing Committee of the American Leather Chemists' Association—is designed to test the resistance of any type of leather to the growth of molds and mildews. The procedure includes inoculation of the specimens with a standard mixture of spores from fungi which grow vigorously on leathers and exposure of the inoculated specimens in a chamber under controlled laboratory conditions favorable to accelerated growth of fungi.

## AGRICULTURAL METEOROLOGY

[Miscellaneous papers on meteorology] (*Amer. Geophys. Union Trans.*, 25 (1944), pt. 3, pp. 397-405, 420-438, 439-441, 443-457, 464-476, 480-502, illus. 32).—The following are included: A Dew-Point Apparatus for Use in Agricultural Climatology, by A. G. Dinaburg (pp. 397-399) (U. S. D. A.); A Descriptive Graph of Climate, by E. E. Foster (pp. 399-405); Some Uses and Deficiencies of Climatological Data, by K. F. Keefer (with discussion) (pp. 420-438); Climatological Actinometry and Its Present Needs, by A. Breese (pp. 439-441); A Simple Mechanical Aid in the Statistical Analysis of Climatic Data, by H. Neuberger (pp. 443-445) (Pa. State Col.); Radiation and Cloudiness, by V. Conrad (pp. 445-455); On the Relation Between Mean Cloudiness and the Number of Clear and Cloudy Days in the United States, by H. Landsberg (pp. 456-457); Trends and Singularities in the Mean Temperature-Data of Saint Louis, Missouri, by R. R. Heinrich (pp. 464-468); Comparison of Air-Mass Maps With Precipitation-Records, by A. T. Lenz (pp. 468-470) (Univ. Wis.); Consideration in the Use of Mount Washington Pressure-Data, by R. E. Falconer (pp. 470-476); On Climatic Anomalies—Atmospheric-Pressure Problems, by H. Arctowski (pp. 480-482); Errors in the Synoptic Weather-Charts Which Cover the Greenland Region, by W. H. Hobbs and R. L. Belknap (pp. 482-490); Rhythm in the Greenland Glacial Anticyclone, by W. H. Hobbs (pp. 491-494); and International Cloud-Nomenclature and Coding, by C. F. Brooks (pp. 494-502).

Constant pressure maps: Methods of preparation and advantages in their use, J. R. FULKS (*Amer. Met. Soc. Bul.*, 26 (1945), No. 5, pp. 133-146, illus. 6).—The discussion, with formulas, includes the use of the same wind scale for all levels, determination of the field of mean virtual temperature between levels, estimating temperature advection, the field of solenoids, comparison of the isentropic chart, determining and forecasting upper winds, the general method of constructing constant-pressure charts for several levels, and the construction of the 1,000-millibar chart.

Computing 10,000-foot pressures from surface data, F. K. DAVIS, JR., and W. H. KLEIN (*Amer. Met. Soc. Bul.*, 26 (1945), No. 5, pp. 147-152).—Each formula presented is said to offer good results in the area for which it was derived and in areas with similar meteorological conditions and to give better results than either the assumption of a moist adiabatic or a constant average lapse rate. The first constant in each formula is a function of the average lapse rate. The remaining terms account for 25-35 percent of the possible variation from the average; the formulas therefore give errors in extreme cases of stability or instability. The formulas give better results at middle latitudes and at coastal stations, where daily variability of lapse rate is small as compared with high latitudes and inland stations.

Stability-suppression of turbulence as indicated by diurnal change of velocity-profile over smooth ground, F. A. BROOKS and W. P. BERGGREN. (Calif. Expt. Sta.). (*Amer. Geophys. Union Trans.*, 25 (1944), pt. 3, pp. 476-480, illus. 1).—It is concluded that the existence of parcels of laminar flow or "slow-eddy" motion as a result of local suppression of turbulence by strong buoyancy-stability would decrease the shearing resistance at moderate distances above ground. Interpretation of typical velocity and temperature profiles indicates such an effect as noticeable from a height of 6 ft. upward, and that a two-thirds decrease in shear stress may occur above 14 ft. Accurate and simultaneous observations of velocity and temperature profiles are deemed essential to further study of diurnal change of shear stress.

The 1944 hurricane in New England, N. P. HILL (*Auk*, 62 (1945), No. 3, pp. 410-413).—The ornithological results in New England of the hurricane of September 14, 1944, are reported and the course of the storm is described. The large numbers of black skimmers is the item of particular interest. There was considerable loss of bird life, particularly among the smaller birds of Cape Cod.

The structure of the September 1944 hurricane when off Cape Henry, Virginia, H. WEXLER (*Amer. Met. Soc. Bul.*, 26 (1945), No. 5, pp. 156-159, illus. 2).

A flight into the September 1944 hurricane off Cape Henry, Virginia, F. B. WOOD (*Amer. Met. Soc. Bul.*, 26 (1945), No. 5, pp. 153-156, illus. 2).

Use of equivalent-potential temperatures in the analysis of dependent climate, R. R. HEINRICH (*Amer. Geophys. Union Trans.*, 25 (1944), pt. 3, pp. 457-464, illus. 4).—In order to evaluate the air-mass factor in the St. Louis (Mo.) climate, a preliminary attempt was made to apply a combination of climatological and synoptic technics to analyses of data from the St. Louis University Meteorological Observatory. Daily values of the surface observations of temperature, pressure, and dew point for 1913-42 were utilized for calculating daily mean surface equivalent-potential temperatures; a smoothed 30-yr. normal curve for the last quantity was obtained by Fourier analysis. Comparison of the actual surface equivalent-potential temperatures for 1932-41 with the normals indicated the variability of the air-mass climate; departures from normal are real characteristics of the climate. The contrasts of the four major seasons are emphasized by tabulated quantitative data. Winter is the time of greatest mean uniformity; spring and fall are transitional intervals. The air-mass climate is highly continental in winter but shows an increasing tendency toward a maritime character with approach of summer. The moisture potential of maritime air as well as other physical and dynamic factors is important in governing the occurrence of precipitation in this area. The dependence of rainfall on tropical maritime air is especially pronounced in May and September—the months of peak precipitation. It is suggested that tropical maritime air over St. Louis during these months is due to the opportune positions of the semipermanent pressure centers over land and sea—particularly the location of the Azores-Bermuda cell over the Atlantic. Equivalent-potential

temperature difference was introduced for making air-mass climatic comparisons between selected stations of the Mississippi Basin, and the results—although sketchy—warrant a further use of this quantity in air-mass climatology. Moreover, after further study this value may prove useful in predicting temperatures which result from accumulative warming by radiative and turbulent transitions of the surface layers of air masses.

The effective rate of altitudinal change in temperate Atlantic climates, G. MANLEY (*Geog. Rev.*, 35 (1945), No. 3, pp. 408–417, illus. 1).—This is a critical discussion and comparison (24 references) of the rates of altitudinal changes in the climates of Great Britain and America and their effects on plants, animals, and man. Special consideration is given to the northern English Pennines and the mountains of New England, the ratio between the "active growing season" and the "average interval between killing frosts," other comparisons of the rate of altitudinal change, the meteorological basis of such change, and the British climate as an asset.

The effects of atmospheric humidity on animal life, D. LUDWIG (*Physiol. Zool.*, 18 (1945), No. 2, pp. 103–135).—This critical review (over four pages of references) is limited to a discussion of experimental work on terrestrial invertebrates and those lower vertebrates which are normally exposed to the effects of atmospheric humidity. The bulk of the literature on this subject deals with the terrestrial arthropods among the invertebrates and with adult amphibians among the vertebrates.

A comparison of vertical and tilted rain-gages in estimated precipitation on mountain watersheds, H. C. STOREY and H. G. WILM. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, 25 (1944), pt. 3, pp. 518–523, illus. 3).—On a small watershed of rough and steep topography about 30 miles east of Los Angeles, tilted rain gages provided records on precipitation which were usually higher than those from vertical gages; the excess catch in tilted gages usually rose with increasing size of storm. The magnitude of differences between paired vertical and tilted gages appeared strongly affected by the prevailing direction of the wind. Tilted gages facing directly into the wind showed the greatest excesses in catch; those facing away from the wind generally caught less rain than the vertical gages; those normal to prevailing winds showed no significant differences in catch. Tilted gages should be expected to provide a closer approach than vertical ones to the true precipitation caught on a mountain watershed, with the reservation that enough gages must be installed to provide a truly representative sample of the various slopes and exposures existing in the drainage area studied.

Rainfall-measurement as influenced by storm-characteristics in southern California mountains, E. L. HAMILTON. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, 25 (1944), pt. 3, pp. 502–518, illus. 14).—This study—made about 30 miles from Los Angeles—concerned especially the direction and angle of inclination of rainfall; from 173 storms producing 251 in. of rain in a 7-yr. period, a representative sample of 60 storms was studied in detail. From records of a directional rotating rain gage, it was found possible to determine what proportion of rainfall in each storm entered the gage from each of the four cardinal sectors of the compass and to calculate the average angle of inclination of rain from the vertical. From a study of simultaneous records of rainfall in the same storms as recorded in an intensity gage and records of direction and velocity of the wind, the rainfall of each storm was allocated to eight directional sectors of the compass. Graphic representations of storm patterns were developed from these data which permitted classification of the storms on the basis of direction from which the rain fell. These data also rendered possible the computation of the angle of inclination of the rain. The study supplied information as to the behavior of storms and the

rainfall occasioned by them—with particular reference to the local conditions. It was found that northerly storms usually produce small amounts of precipitation occurring generally at low intensity and at only slight inclinations from the vertical. Southerly storms, on the other hand, are the great rain producers; their precipitation is usually of much greater intensity, they are accompanied by higher winds, and their precipitation is usually inclined considerably from the vertical. These findings further explain the differences in rain catchment by paired vertical and tilted gages reported from a study by Wilm et al. in the same vicinity (E. S. R., 82, p. 153). Southern California storms follow definite readily classified patterns. These storm groups have definite characteristics whose interpretation is necessary in determining the proper distribution and exposure of rain gages on a watershed to insure accurate measurement of precipitation. The findings can also be used for correcting and interpreting past rainfall records in this region; the principles developed should have universal application. There are 19 references.

## SOILS—FERTILIZERS

[Soils investigations at the Florida Station] (*Florida Sta. Rpt. 1944*, pp. 88–98).—Detailed information is given in connection with the minor elements content of various samples of tungseed meal. The studies have for their purpose the establishment of soil and plant relationships and the possible relationship between composition and quality of food and feed plants. Other soils investigations for which data are given in these pages include types and distribution of micro-organisms in some Florida soils; the interrelationship of microbiological action in soil and cropping systems in Florida; composition of Florida soils and of associated native vegetation; factors affecting the growth of legume bacteria and nodule development; maintenance of soil reaction and organic matter and their role in retention and availability of major nutrient elements; significance of levels of readily soluble major nutrient elements removed by various extraction procedures from Florida soils under various cropping practices; correlation of inherent and induced soil characteristics with pasture crop response; effect of chemical and physical characteristics of Florida soils on the mineral composition of vegetable crops; and soil factors affecting the availability of minor elements in fertility studies with certain truck crops.

**Key to the soils of Kansas**, A. W. GOKE (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 353–354).—The author describes, in part, a classification based upon a primary division into two topographic groups, the first comprising soils developed on the upland and the second those developed in the valleys. "Aside from this one instance, separations throughout each step in the chart are made on the basis of outstanding differences in the profile which enable one to divide each group into two subgroups. The soil groups are classified and differentiated on the basis of texture in the profile, with a single exception. This exception is the upland group with a developed profile but with a distinctly heavy B horizon. Here the division begins on the basis of the color of the surface soil, because differences in color are the most outstanding contrasting characteristic of this group." Separations into subgroups among the upland and the valley soils, respectively, are made upon somewhat different principles corresponding to what are held to be the outstanding subclassifying differences. The chart in which the system has been arranged for use is described, but not reproduced with this paper.

**Physical and chemical properties of some important soils of the Southeast used for the production of tung oil**, R. S. DYAL and M. DROSDOFF. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 317–322).—The soils examined were sandy loams from northern and western Florida and southern Alabama,

Mississippi, and Louisiana; and sands and loamy sands from peninsular Florida.

The low pH and soluble phosphate values emphasize the need for lime and phosphate fertilization on most of these soils. It was further found that the organic-matter content of the surface soils has a mean of 2.25 percent. The base-exchange capacity of these soils is relatively low and does not usually exceed 10 milliequivalents per 100 gm. of soil, even where the clay content is high (indicating the kaolinite type of clay mineral as predominant in these soils). The values for exchangeable bases are low, calcium predominating, potassium present in the smallest quantity, and exchangeable magnesium intermediate. The soils from northern Florida are especially low in potassium, and symptoms of potassium deficiency have been found prevalent in tung orchards in that general area. The data on the sands and loamy sands from peninsular Florida show very low clay and organic matter contents, resulting in low exchange capacities. The values for exchangeable bases are low and many deficiency symptoms are prevalent on trees in the area, except where they have had adequate fertilizer. Some data on moisture relations of representative samples indicate that available soil moisture at field capacity is low, regardless of the organic matter and clay content of the soil.

**Elementary mechanics of aggregation of puddled materials**, J. R. McHENRY and M. B. RUSSELL. (*Iowa Expt. Sta.*). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 71-78, illus. 8).—Repeated alternate wetting and drying of sand-clay mixtures increased aggregation to a maximum, which was followed by a decrease. Clay and sand mixtures showed a decrease in water stability as the moisture content at the time of sieving was increased. Several Iowa soils gave contrary results, those high in organic matter exhibiting a sharp rise in aggregation as moisture increased to about the moisture equivalent. From this point on, the aggregation appeared nearly stable or decreased slightly. When samples of clay and sand were treated with organic matter, similar curves resulted. Aggregation of clay-sand mixtures increased logarithmically with increase in clay content. When silt was added, more clay was necessary to produce measurable aggregation of a similar magnitude. Monovalent ions gave better aggregation of puddled mixtures of sand and clay and silt than did divalent ions, which, in turn, were superior to trivalent ions. The results indicated that water-stable aggregates form only in the presence of a dipole liquid, and that solvation of the exchangeable ions of the clay complex is also necessary for maximum aggregation. Undecomposed organic matter markedly reduced aggregation.

**Hydrogen-ion concentration of the important soils of the United States in relation to other profile characteristics—II, Pedalfers and soils transitional between Pedocals and Pedalfers**, E. H. BAILEY. (U. S. D. A.). (*Soil Sci.*, 59 (1945), No. 3, pp. 239-262).—The present paper (E. S. R., 92, p. 16) deals with the Pedalfers and the soils transitional between the Pedocals and the Pedalfers, considering only the most important series and the most representative profiles. Representative of the Podzols are the Becket, Berkshire, and Brassua soils (New Hampshire, Vermont, and Massachusetts) and the Roselawn and Au Train soils (Michigan), in which the solum pH value varies between 3.1 and 5.5; that of the C horizon from 4.5 to 5.8. The Gloucester series (Massachusetts) represents the Brown Podzolic soils—solum pH ranging from 3.7 to 5.2, with a C horizon reaction of from pH 4.6 to 5.7. Gray-Brown Podzolic soils included are the Chester, Collington, Hagerstown, and Sassafras (New Jersey, Indiana, Pennsylvania, and Maryland) and the Clinton and Miami series (Michigan, Wisconsin, and Indiana). Of these six soils, the solum pH values vary from 3.4 to 7.9 and those of their C and D horizons from 3.8 to 8.5. The Red Podzolic soils (five series in the South Atlantic States and Alabama) showed a pH range of from 4.2 to 6.6, with a tendency to greater acidity in the lower horizons, and the Yellow Podzolic soils

(three series from western and southern States) pH values for the profiles of from 4.0 to 6.1. Of the three noncalcic Brown soils (Sierra series, California), the pH values found ranged from 5.9 to 6.6, these soils, together with the Prairie and Reddish Prairie soils, being transitional between Pedocals and Pedalfers. Of the Prairie soils represented by four series in Illinois, Iowa, and Indiana, the solum pH values were found to range from 5.0 to 8.1; those of the C horizon from 5.6 to 8.5. The Reddish Prairie soils, of which the examples were taken from Missouri, Kansas, and Oklahoma, showed solum pH values of from 4.7 to 7.9; those of their C horizons ranged from 5.0 to 7.8.

\* Seventy-five references to literature are cited.

**Isohydric pH, pH of soil paste, and pH of exchange neutrality,** W. T. McGEORGE. (Ariz. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 3, pp. 231-237, illus. 3).—The author reports upon comparative experiments which show that determination of the pH value on a soil paste, at a moisture content approximating the moisture equivalent, accomplishes the same objective as that sought by Maitson and Wiklander (E. S. R., 83, p. 23) in their pH of exchange neutrality and by Puri and Sarup (E. S. R., 80, p. 307) in their isohydric pH. This agreement of the three methods tends to confirm the value of the paste method for determining the pH of any soil type.

**Cationic activities, exchangeable bases, and uptake by plants,** C. E. MARSHALL. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 175-178).—Some fundamental theoretical considerations are outlined briefly under the heads of thermodynamic considerations, the chemical environment of the plant root, mutual effects of various cations, etc. As illustrative examples of root environment conditions, the author cites calcium : potassium ratios in culture solutions and in soils, and calcium : potassium ratios in relation to stage of growth.

**Some effects of developing alkalinites and other factors upon ureaselike activities in soils,** J. P. CONRAD. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 171-174, illus. 2).—After the adsorptive capacity of the soil for urea had been satisfied in former percolation tests, a constant rate of percolation in the presence of toluene gave almost a constant reduction in the concentration of the percolating urea solution with most of the soils studied. Certain soils after a few percolations exhibited, however, a rapidly rising rate of urea hydrolysis. No increase in micro-organisms in the presence of toluene was found. Addition to the soil of alkaline materials, such as  $\text{NH}_4\text{HCO}_3$ ,  $\text{CaO}$ ,  $\text{MgO}$ , etc., enhanced the rate of urea hydrolysis in the presence of toluene. In certain soils, toluene itself appeared to increase the rate of urea hydrolysis.

Tentative explanations of these observations are offered.

**Estimating the moisture content of the 0- to 6-inch soil horizon from climatic data,** A. W. ZINGG. (Mo. Expt. Sta. and U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 109-111, illus. 1).—Precipitation and temperature data secured at Bethany, Mo., during the years 1934-36 were found to be related to the moisture content of the 0- to 6-in. soil horizon. Of the several exponential relationships determined, total precipitation and average temperature for a 3-week period and the number of days required for 0.5 in. of rainfall to accumulate prior to the time of moisture determination gave the most practical equation for estimating soil moisture. After the factors giving the most practical estimate of soil moisture for a rotation average of corn, small grain, and meadow had been ascertained, equations containing these variables were derived for corn, oats, meadow, and bluegrass. A comparison of soil moisture, as calculated from estimating equations, to measured soil moisture under each crop is shown. An average of 10-yr. climatic data was substituted in equations developed from 3 yr. of moisture data to illustrate seasonal moisture trends under the several crops on the Shelby soils.

**Moisture and energy conditions during downward entry of water into soils,** G. B. BODMAN and E. A. COLMAN. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 116-122, illus. 6).—Screened and well-mixed lots of soils were packed, air-dry, to uniform apparent densities in brass tubes, all 2 in. in diameter but of different heights, the tubes having been made up from short cylinders each 5 mm. high. Stacks of these shorter cylinders were built up and bolted together to form taller tubes of the required heights. The 5-mm. cylinders were so designed that a sheet of 35-gage phosphor-bronze could just be inserted between them, at the end of a run, when it was desired to sample the soil column by slicing. This type of construction was found to prevent the trapping of bodies of air which, when subjected to compression by penetrating water, may reduce infiltration rates. The isolation of the entire set of individual soil slices in the column was generally accomplished in less than a minute. It is believed, therefore, that no significant moisture changes took place after the slicing had begun. Because the method of flooding used excluded the impact effect of water drops falling on the soil surface, in-washing of colloids and clay migration were probably negligible. The diminishing infiltration rate : time relation was of the same type as that frequently observed in both field and laboratory, however.

The soil moisture distribution, moisture-potential conditions, and permeabilities observed within the infiltration zone have made it possible to explain the changes in infiltration rate on the basis of physical laws governing the flow of water through soil, and "strongly suggest that infiltration rates approach a final constant value. This final rate is determined by a total potential gradient within the upper part of the wet soil equal to that of the gravitational potential, and a permeability at 30° C. corresponding to a pressure potential of about  $-28 \times 10^4$  e. per gram." It is suggested that the moisture potential conditions within the infiltration zone represent the fundamental factors influencing the change in infiltration rates, and that the other factors cited operate as modifying influences.

**Effect of water temperature on rate of infiltration,** F. L. DULEY and C. E. DOMINGO. (Nebr. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 129-131, illus. 2).—Water applied to the soil by sprinkling from a height of about 6 ft. at approximately 70° F. entered the soil at so nearly the same rate as water at 40° that no significant difference could be detected. When the temperature of the water applied was 100°, a slight increase in the infiltration rate over that at 40° could be observed. The increase in rate of intake of the warm water over the cooler water was not proportional to the change in the specific viscosity of the water, but apparently was greatly affected by other factors. It appeared doubtful if the variation in infiltration rate due to the rather narrow range in temperature likely to occur in natural rainfall would be sufficient to have any practical significance in determining the amount of rainfall that would be absorbed by agricultural land.

**Significance of the composition of soil air in Everglades peat land,** J. R. NELLER. (Fla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 341-344, illus. 4).—Equipment for the periodic collection of samples of soil air at certain fixed levels below the surface of Everglades peat land is described.

At 8.5 in. below the surface, the concentration of carbon dioxide never much exceeded 4 percent of the soil air by volume whether the water table was held at 24 or at 36 in. below the surface. It was somewhat less over a 12-in. water table. At the 21.5-in. level, the concentration of carbon dioxide often exceeded 10 percent. The soil air contained somewhat more carbon dioxide during the rainy season. The carbon dioxide found in Everglades peat was generally balanced by a correspondingly decreased quantity of oxygen, but in the deeper zones more oxygen than was accounted for in the carbon dioxide was lacking.

**Effect of crop and surface mulches on runoff, soil losses, and soil aggregation,** C. A. VAN DOREN and R. S. STAUFFER. (Ill. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 97-101, illus. 6).—Runoff and soil losses on a permeable prairie soil with 4-percent slope were determined by the use of a rainfall simulator.

On plots mulched with wheat straw under comparable tillage conditions, runoff and soil losses were greater from corn plots than from soybean plots. All of the mulches used were effective in reducing runoff and soil losses. Wheat straw was especially so. Corn stover, which is greater in bulk and provides a more complete coverage of the surface than soybean residue, was also more effective in reducing runoff and erosion.

Preliminary results of aggregate analysis indicate that straw mulch very definitely favored aggregation of the soil. Soil from the unmulched corn plots contained a higher percentage of total aggregates than that from unmulched soybean plots.

Corn yields were reduced by the application after seeding of a wheat straw mulch. Soybean seed yields were reduced slightly in 1942 but were increased by the application of mulch in 1943. Soybean hay yields were increased by mulching in 1941 but were reduced in 1942.

**Effect of mulches on soil properties,** R. E. STEPHENSON and C. E. SCHUSTER. (Oreg. Expt. Sta. coop. U. S. D. A.). (*Soil Sci.*, 59 (1945), No. 3, pp. 219-230).—Moisture conservation, nutrient supply, and soil structures were compared on six treeless plots under different treatments (under uncultivated sod; scraped and kept bare of growth; under tillage mulch; spaded rough; under straw mulch; and under trash mulch) and on an adjacent orchard in sod.

The straw mulch saved moisture equivalent to 2 or 3 in. of rainfall in dry weather, principally in the upper 2 ft. of soil. The trash mulch had a lesser moisture-saving effect. Nitrates were as high under straw mulch after it had been established for 3 yr. as under clean cultivation, and the soil cultivated or mulched with straw was generally higher in nitrates than the plot scraped to control vegetation. The scraped plot became drier than the other plots. The straw mulch caused a marked increase in soluble potassium but little increase in calcium in the topsoil. Trash mulch increased the soluble potassium to a lesser extent than did the straw. But straw and trash mulches increased the organic matter content of the topsoil and the water-stable aggregates. The increase in the larger aggregates was most noticeable.

**Availability of replaceable calcium from different types of colloids as affected by degree of calcium saturation,** W. H. ALLAWAY. (Nebr. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 3, pp. 207-217, illus. 6).—The availability to soybean seedlings, replaceability by H ions, and replaceability by Ba ions of the replaceable Ca of colloidal kaolinite, illite, two bentonites, and peat—each of which was studied at three degrees of Ca saturation—were measured.

The order of various colloids with respect to availability of the replaceable Ca to soybeans was peat>kaolinite>illite and Wyoming bentonite>Mississippi bentonite. In every colloid, the availability of the replaceable Ca was increased by increases in percentage Ca saturation. The two bentonites, both of which are considered to be good examples of the montmorillonite group, showed a considerable difference in the replaceability and the availability to plants of their replaceable Ca. The quantities of Ca taken up by the soybean plants were very closely related to those replaced by an equivalent quantity of HCl. There was little difference, particularly at high degrees of Ca saturation, in the replaceability of the replaceable Ca of the five colloids studied by Ba ions. The quantities of Ca taken up by the plants were not related to those replaced by Ba ions.

"These results suggest that soils with different types of colloids may show marked differences in the availability of their replaceable Ca, and that the amount of Ca replaced from the soil by a small amount of an acid offers promise as a measure of the Ca fertility of that soil."

**Residual effect of varying applications of potash on the replaceable potassium in several Mississippi soils.** C. D. HOOVER. (Miss. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 144-149, illus. 1).—The author concludes, from fertilizer trials here reported upon, that potassium may accumulate in the A horizon in replaceable form when applied annually in excess of plant needs, and that this accumulation increases with the rate of application; that on soils having normal profile development, relatively small quantities of applied potassium are leached from the A to the B horizon; that surface soils often have a content of replaceable potassium much higher than that of the B horizon; and that on soils having less than 0.20 milliequivalents replaceable potassium per 100 gm. of soil, cotton may be expected to respond profitably to the application of potash if the supply of nitrogen and phosphate is adequate.

**Potassium release from soils as affected by exchange capacity and complementary ion.** L. F. SEATZ and E. WINTERS. (Univ. Tenn.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 150-153).—In eight soil samples of widely different capacities and saturated with H, with Ca and H (50 percent each), and with Ca, the release and fixation of K depended on the quantity added to the soil. At the lowest rate of addition, all the added K, plus some released from a fixed form in the soil minerals, was recovered. At the highest rate of application, only about 70 percent of the added K was recovered except in one soil. X-ray data on three similar samples indicated that fixation tended to be greatest in the soil that contained the highest proportion of the mica and montmorillonitic types of clay minerals. No consistent relation was found between the exchange capacity and K release. At the lower rates of K application, more K was recovered where Ca rather than H was the complementary ion. At the highest rate, the complementary ion had little effect on the release of K.

**The role of iron and aluminum in the retention of phosphates by soils as indicated by the solubility of phosphorus.** F. L. DAVIS. (La. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 167-170, illus. 4).—A laboratory procedure for studying the retention of phosphates by soils at equilibrium in soil-Ca(OH)<sub>2</sub>-H<sub>2</sub>O-air systems is reported upon, together with the effect of additions of ferric and aluminum chlorides upon the differential solubility of added phosphates. The phosphate retained by the Al-treated soil was more easily soluble than that retained by Fe-treated soil. Under the conditions of these experiments, the effect of the iron and aluminum upon the retention of phosphates by soils appeared to operate through the soil colloids.

**The effect of particle size of copper- and zinc-source materials and of excessive phosphates upon the solubility of copper and zinc in a Norfolk fine sand.** V. C. JAMISON. (Fla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 323-326, illus. 2).—The finely crystalline sulfates of copper and of zinc showed a tendency to form insoluble complexes in this soil greater than that shown by the same salts when added in a coarsely crystalline form. Normal additions of a phosphate fertilizer appeared to have little or no effect on availability of copper or zinc added to these soils as the sulfate.

**Agronomic relationships of sodium cyanide.** M. M. McCOOT (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 10, pp. 455-461, illus. 1).—Sodium cyanide raised the pH values of Norfolk and Leon sands and Culvers and Lordstown soils; addition of 50 and also 100 p. p. m. to Gloucester loam increased the rate of nitrate formation, and 200 and 400 p. p. m. at first retarded but later increased it.

Increase in the ferrous iron in several soils resulted from adding sodium cyanide to them. HCN was released on addition of sodium cyanide to soils, the rate of loss and total amount given off being greatest in Gloucester loam with low and least with high water contents. The rate and amount of release from Leon sand did not vary significantly until the water content approached the saturation point; loss from Webster, Podunk, and Weatherfield soils and Leon sand did not vary significantly when their water contents were similar.

## AGRICULTURAL BOTANY

**Thomas Jefferson:** His interest in plant life as revealed in his writings, II, E. H. FULLING (*Bul. Torrey Bot. Club*, 72 (1945), No. 3, pp. 248-270).—In summarizing this installment (E. S. R., 92, p. 476), it is said that "Jefferson's claim to fame in the realm of pure botany lies solely in the botanical aspects of two great projects which he conceived and executed, namely, the Lewis and Clark Expedition from St. Louis to the Pacific coast and the founding of the University of Virginia. Among the fruits of the former was a collection of plants, in the naming and preservation of which Jefferson was much concerned; and as part of the latter, he sponsored a school of botany which was established and a botanical garden which never materialized. Outside his sponsorship of these two successful enterprises he contributed nothing by way of personally adding to the contemporary understanding of plants."

**Plants and plant science in Latin America,** edited by F. VERDOORN (*Waltham, Mass.: Chron. Bot. Co.*, 1945, pp. 381+, illus. 83).—The aim of this collection of articles by many authors is to give the agronomist, botanist, forester, and plant pathologist—whether in the Americas or in Europe—information which he might need when starting work on the wild or cultivated plants of Latin America. Part 1 (pp. 1-258) consists primarily of articles not previously published; part 2 (pp. 259-336), with few exceptions, of reprints—mostly somewhat revised—of articles already published in *Chronica Botanica*. Supplementary material includes selected lists of travel books and other references of botanical interest, of recent publications of the U. S. D. A. Office of Foreign Agricultural Relations, and of plant science institutions and societies in Central and South America. A detailed table of contents and an author index are provided.

**Hayfever plants: Their appearance, distribution, time of flowering, and their role in hayfever,** with special reference to North America, R. P. WODEHOUSE (*Waltham, Mass.: Chron. Bot. Co.*, 1945, pp. 245+, illus. 79).—This monograph is intended to interpret the botanical facts of hay fever in terms of their clinical significance. Here are described all the plants known to cause hay fever, most of those reasonably suspected of doing so, and many which have been mentioned—possibly wrongly—in hay fever literature. English names, as well as Latin binomials, are included insofar as known to the author; in fact an attempt has been made to present all the vernacular names which have any use or value whatever. Unless otherwise noted, all illustrations are by the author and mostly from living material. Regional surveys are included, and a glossary, bibliography (9 pages), and author and general indexes complete the work.

**The proper designation of the vascular plants,** T. Just (*Bot. Rev.*, 11 (1945), No. 6, pp. 299-309).—"The status and growth of taxonomic, morphological, and paleontological knowledge of the plant kingdom are to a large extent reflected in the various classifications adopted from time to time. Consequently new advances and viewpoints are likely to result in proposals for certain rearrangements or new alliances which are often accompanied by new designations. Thus it is not at all surprising that in recent years several new names have been proposed for

the higher taxonomic unit comprising all vascular plants. . . . It seems desirable, therefore, to consider at this juncture the more important designations proposed for the vascular plants together with the criteria and evidence claimed in their support." There are 80 references.

An easily assembled machine for making cotton plugs for culture tubes, O. K. STARK (*Science*, 101 (1945), No. 2629, p. 521).—The essential unit is a Waco Power Stirrer which has two shafts, one running at 300 and the other at 600 r. p. m. The only additional requirement is a foot-controlled rheostat for starting, stopping, and controlling the speed of the motor. With a little practice it is possible to make about 150 plugs per hour; they are of any desired size and can be used time after time.

Aislamiento, incidencia, y caracterización del bacteriófago de *Rhizobium meliloti* [Isolation, incidence, and characterization of the bacteriophage of *R. meliloti*], A. SÁNCHEZ MARROQUÍN and C. CASAS CAMPILLO (*An. Escuela Nac. Cien. Biol. [Mexico]*, 3 (1944), No. 3-4, pp. 305-329, illus. 1; Eng. abs., p. 325).—This study involved 48 soil samples; 100 percent infestation by bacteriophage was found in soils in alfalfa, but no relation between its incidence and soil pH or texture. The variable susceptibility of several strains of *R. meliloti* to the phage and the heterogeneity and differing virulence of its strains were demonstrated; one of the phages isolated was active at a dilution of  $1 \times 10^{-11}$ . In general, the *R. meliloti* phage exhibited no specificity at the time of testing against cultures of *R. phaseoli*, *R. trifolii*, and *R. japonicum*, but a phage was isolated that showed a definite specificity for a susceptible strain of *R. meliloti*. On the other hand, strains of *R. meliloti* were obtained that exhibited notable lyso resistance to a phage the activity of which was  $1 \times 10^{-7}$ . Comparative data on the concentration of the phage in soils are presented in tabular form.

The activity of a bacteriostatic substance in the reaction between bacterial virus and host, T. F. ANDERSON (*Science*, 101 (1945), No. 2631, pp. 565-566, illus. 1).—A note on the bacteriostatic action of Bz-3-methyltryptophan and its reversal by tryptophan on *Escherichia coli*.

Bacteriostatic and bactericidal properties of 2,4-dichlorophenoxyacetic acid, E. C. STEVENSON and J. W. MURCHELL. (U. S. D. A.). (*Science*, 101 (1945), No. 2634, pp. 642-644).—The specificity of this substance in killing certain weeds and the well-known bacteriostatic properties of some other aromatic compounds suggested that it might affect the growth of fungi and bacteria. The salient points in the tests reported are that addition of 0.02 percent 2,4-dichlorophenoxyacetic acid or its Na salt with or without 0.5 percent Carbowax into potato-dextrose agar decidedly retarded the growth of *Bacillus subtilis*, *Aerobacter cloacae*, *Staphylococcus aureus*, and *Phytomonas tumefaciens*, but had no apparent effect on that of *Fusarium* sp. and *Penicillium* sp.; at 0.08 percent and otherwise similar conditions, growth was prevented in *B. subtilis*, *S. aureus*, and *Phytomonas tumefaciens* and retarded in *A. cloacae*. Growth of the *Fusarium* and *Penicillium* was not affected noticeably by the 0.08 percent concentration of the acid or its salt nor was the growth of *P. notatum* visibly affected by the salt.

Strain specificity and production of antibiotic substances.—IV, Variations among actinomycetes, with special reference to *Actinomyces griseus*, A. SCHATZ and S. A. WAKSMAN. (N. J. Expt. Stas.). (*Natl. Acad. Sci. Proc.*, 31 (1945), No. 5, pp. 129-137).—In further studies (E. S. R., 91, p. 651), a strain of *A. griseus* characterized by the production of the antibiotic substance streptomycin proved capable of variation, some of the variants producing no aerial mycelium and no streptomycin and being characterized by other properties distinguishing them from the original culture. Sporulating and streptomycin-producing strains comparable in many respects to the original culture could be isolated under certain conditions

of cultivation from the nonsporulating variants. The original culture had all the properties of the newly created genus *Streptomyces*; the variant, however, could be classified within the genus *Nocardia*. The question is therefore raised as to what extent may many of the species of *Nocardia* described in the literature represent variants of *Streptomyces* spp. that have lost the property of producing aerial mycelium.

**Crystalline reineckates of streptothricin and streptomycin**, J. FRIED and O. WINTERSTEINER (*Science*, 101 (1945), No. 2633, pp. 613-615).—Streptothricin, the antibiotic from *Actinomyces laverdulae*, and streptomycin, a closely related substance from *A. griseus*, have been intensively studied recently by various workers because of their possible utility for controlling infections resistant to penicillin; published information as to their chemical nature is, however, scant and preliminary. The authors report the isolation from submerged culture filtrates of the respective organisms of both agents in the form of their crystalline salts with reinecke acid; these proved antibiotically active in proportion to their content of the base component. The methods used and the results obtained are briefly described.

**A simplified method for the assay of antibiotics**, I. N. ASHESHOV and F. STRELITZ (*Science*, 101 (1945), No. 2633, pp. 621-622).—The essentials of the method described are that soft nutrient agar (about 0.3 percent) is inoculated in bulk with the test organism, distributed into tubes, and left to solidify in an upright position. The solution to be tested is added on top of the stab. The intensity of antibiotic activity is determined by the depth of the clear zone of growth inhibition extending downwards from the area of contact between the agar and the solution.

**Assay of the rates of secretion of antibiotic in different regions of a growing mould colony**, G. PONTECORVO (*Nature [London]*, 155 (1945), No. 3939, pp. 515-516, illus. 1).—Colonies of the antibiotic fungus are grown on disks of permeable Cellophane 600 over a very dilute agar medium. When the colony has reached the desired diameter it is transferred for 1 hr. three or more times to fresh medium, thus removing any appreciable amount of lingering antibiotic. The colony is then transferred to hard agar 3 mm. deep and left for a short time (10-60 min.); the antibiotic secreted during this time diffuses into the agar. The region of agar over which the colony was lying is immediately punched all over with a glass tube 3 mm. in diameter; the resulting small cylinders of agar impregnated with antibiotic are then placed face down on the surface of a testing agar medium (e. g., the usual agar nutrient, *Staphylococcus*). The size of the inhibition ring gives an estimate of the amount of antibiotic secreted into the block, i. e., an estimate of the rate of secretion.

**Green pea juice as a medium for the production of penicillin**, R. P. COOK and W. J. TULLOCH (*Nature [London]*, 155 (1945), No. 3939, p. 515).—A press juice made from entire green peas (seeds and pods) is reported to have formed an excellent medium for penicillin production; this juice may be preserved either in dry or frozen states. A striking feature of this medium is the rapid covering of its surface.

**Antibiotic action of an Aspergillus strain against Mycobacterium tuberculosis**, P. KALLÓS (*Nature [London]*, 155 (1945), No. 3932, p. 300).—A note.

**Allixin, the antibacterial principle of Allium sativum**, II, III (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 11, pp. 1952-1954, illus. 1; 67 (1945), No. 6, pp. 1032-1033).—A continuation of the series (E. S. R., 92, p. 481).

**II. Determination of the chemical structure**, C. J. CAVALLITO, J. S. BUCK, and C. M. SUTER.—The tentative chemical structure of allicin is presented and its reactions are discussed.

III. *Its precursor and "essential oil of garlic,"* C. J. Cavallito, J. H. Bailey, and J. S. Buck.—It is shown that whole garlic contains the active principle in the form of a thermostable precursor which is very rapidly broken down to yield allicin when the cells are crushed. This conversion occurs only in the presence of an enzyme and water. The precursor and enzyme are apparently present in different cells of the plant. The closely allied onion does not contain allicin or the precursor, but some varieties do contain an enzyme similar in action to that of garlic and will yield allicin from the garlic precursor. Garlic preparations in which this enzyme has been destroyed do not possess the characteristic odor or flavor of garlic.

The antibacterial principle of *Arctium minus*.—I, Isolation, physical properties, and antibacterial action, C. J. CAVALLITO, J. H. BAILEY, and F. K. KIRCHNER (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 6, pp. 948-950).—The new agent was isolated from leaves of the smaller burdock, which has a rather low order of activity against gram-positive bacteria and is inactive against the gram-negative group. The compound appears to be a lactone of the empirical formula  $C_{16}H_{26}O_5$ .

Some remarks on mycogenetic terminology, B. O. DODGE (*Mycologia*, 37 (1945), No. 3, pp. 360-369).—A discussion of the terminology of genetics in fungi, with special reference to a paper by Jackson (E. S. R., 92, p. 481) and to previous publications by the author.

The aquatic Oomycetes of Wisconsin, Part 1, F. T. WOLF (*Madison: Univ. Wis. Press*, 1944, pp. 64, illus. 52).—A taxonomic monograph on this group of lower fungi, including keys to the orders, genera, and species.

Studies on the nature of variation in some members of the Fungi Imperfecti, F. R. P. DAVIES (*Minn. Univ. Sum. Ph. D. Theses*, 2 (1943), pp. 39-40).

Flora of Illinois, G. N. JONES (*Notre Dame, Ind.: Univ. Press*, 1945, pp. 317+, illus. 2).—In this monograph (American Midland Naturalist Monog. Ser. No. 2) brief descriptions are given of the area and its vegetational divisions, followed by keys to the sections, families, genera, and species, with annotations. A glossary, bibliography (13.5 pages), and author and plant-name indexes are included, as well as vegetational and county maps of the State.

Contributions toward a flora of Wyoming: [The Zygophyllaceae, Linaceae, and Elaeagnaceae of Wyoming], C. L. PORTER (*Wyo. Univ., Rocky Mountain Herbarium, Leaflets* 9 (1945), pp. 2+, illus. 4; 10, pp. 4+, illus. 19; 11, pp. 4+, illus. 10).

A new pine from Mount Rose, Nevada, H. L. MASON and W. P. STOCKWELL (U. S. D. A. coop. Univ. Calif.). (*Madroño*, 8 (1945), No. 2, pp. 61-63).—*Pinus washoensis* n. sp. is described.

The genus *Jatropha* in America: Principal intrageneric groups, R. McVAUGH (U. S. D. A.). (*Bul. Torrey Bot. Club*, 72 (1945), No. 3, pp. 271-294, illus. 24).—This paper attempts to set forth what appear to be the principal lines of divergence within this euphorbiaceous genus, several species of which—originally American—have become widely dispersed in the tropics because of their cultivation for ornament, shade trees, or medicinal purposes. At least one species—*J. curcas*—has attained notoriety as a common poisonous plant of the tropics, and more lately has been thought of as a possible source of drying oil similar to that from the tung tree. A summary of previous classification of the genus and keys for identification are included in this taxonomic study.

The genus *Hevea* in Colombia, R. E. SCHULTES (*Harvard Univ., Bot. Mus. Leaflets*, 12 (1945), No. 1, pp. 19, illus. 12).

Larger aquatic plants of Minnesota and the factors determining their distribution, J. B. MOYLE (*Minn. Univ. Sum. Ph. D. Theses*, 2 (1943), pp. 51-54).

**Genetica y geobotanica agricolas [Agricultural genetics and phytogeography]** J. M. DUQUE JARAMILLO (*Manizales, Colombia: Imprenta Depart.*, 1944, pp. 273, illus. 19).—This volume considers the history and nature of food plants; inheritance and variation—mechanisms and history; organs of vegetative and floral reproduction; mendelian laws and their mathematical expression and general genetics; agricultural and applied statistics; plant biometry and biometry and mendelism in domestic animals; crops and their culture; phytogeography and elementary ecology; and soil ecological factors as applied to agriculture, including chemical analysis, texture, and structure of soils, influence of slope, circulation of subterranean water, climatological factors, dry-land agriculture, soil biology, soil reaction, and soil acidity as determined by pH potential and colorimetric methods.

A comparative study of the vegetation of grazed and ungrazed canyons of the Wasatch Range, Utah, W. P. COTTAM and F. R. EVANS (*Ecology*, 26 (1945), No. 2, pp. 171-181, illus. 8).—In the two very similar canyons compared, Red Butte Canyon has been protected against grazing for at least 40 yr.; Emigration Canyon has been grazed heavily since settlement in 1847. Palatable vegetation has probably decreased and the unpalatable probably increased in the latter canyon, and only 42 percent as much forage is now produced here as in equal areas of Red Butte Canyon. Ten native grasses found in the latter were not encountered in Emigration Canyon, suggesting the danger of exterminating highly palatable species through grazing abuse. Evidence pointed to the probability of complete substitution of the original grass type with unpalatable shrubs plus *Bromus tectorum* at the mouth of Emigration Canyon; some highly palatable shrubs had a density less than one-third that in Red Butte Canyon, and other shrubs of low palatability had 13 times the density of the same shrubs in Red Butte. The density of ruderals in Emigration Canyon was 12 percent greater and, except for *B. tectorum*, the density was over 7 times greater than in Red Butte. Sheet erosion was general throughout Emigration Canyon and advance gully erosion was common along a sheep trail.

The genus *Cnidoscolus* in Mexico: New species and critical notes, C. L. LUNDELL (*Bul. Torrey Bot. Club*, 72 (1945), No. 3, pp. 319-334).—In carrying out investigations in 1943 to determine the sources of chilte gum, collections of *Cnidoscolus* were made in 11 Mexican States, the areas covered ranging from seashore, arid and wet lowlands, through wet temperature uplands, to desert and mountainous regions of the high plateau. Although the genus has considerable economic importance and is abundantly represented throughout Mexico, it has received very little attention from collectors. In this preliminary study, 12 new species are described.

Axillary cleistogenes in *Stipa leucotricha* and their rôle in nature, E. J. DYKSTERHUIS (*Ecology*, 26 (1945), No. 2, pp. 195-199, illus. 1).—Caryopses produced by cleistogamous spikelets in the basal sheaths of Texas needlegrass propagate the species in its natural environment. Such cleistogenes are commonly, if not always, matured before the panicle spikelets. These axillary cleistogenes are usually produced by seedling plants before the appearance of panicles. At Fort Worth, Tex., such cleistogenes may germinate in October and produce seedling plants, which in turn may bear cleistogenes with endosperm in the dough stage in April, or 6 mo. later. Under heavy grazing, this grass may behave as an annual without production of flowering culms. This may be accomplished by fall seedlings of cleistogenous origin producing new cleistogenes in spring and then succumbing to summer drought. Such cleistogenes have an important rôle in maintaining the species under adverse conditions, particularly under heavy grazing or burning.

A device for measuring *Avena* coleoptile curvature, W. P. JUDKINS. (Ohio Expt. Sta.). (*Science*, 101 (1945), No. 2631, p. 568, illus. 1).—The simple measuring scale described consists of a series of carefully constructed angles which are photographed and then printed on contrast Ortho film to give narrow black lines on transparent celluloid. It is used by moving it laterally over the shadowgraph of the curved coleoptile being measured until the bottom and top of the latter are oriented parallel with the bottom and top lines of one of the angles.

A modified *Helianthus* test, I-III, J. C. FARDON, M. T. MAYNARD, and M. M. A. McDOWELL (*Growth*, 9 (1945), No. 2, pp. 195-205, illus. 3; pp. 207-215, illus. 2; pp. 217-227, illus. 2).

I. Comparative elongation rates employing two methods of applying the growth factors.—In the new type of test described, the substance being tested is admitted directly in solution to the cut surface of the decapitated hypocotyl to minimize diffusion effects. The zone of cell elongation at 5-15 mm. below the cotyledons of the sunflower seedlings—90 hr. old and 45 mm. high—proved to be an excellent indicator of growth stimulation. This method—said to result in more absolute growth than the agar block method—serves as a simple rapid accurate way of determining the growth-promoting power of certain substances on plant cell enlargement. There are 21 references.

II. The effect of pH in certain media on the zone of cell elongation in the hypocotyl of *Helianthus annuus*.—It was found that pH effects are important in determining the efficacy of cell elongation substances on the growth of sunflower seedlings. Different media have different though not very divergent optimum H-ion concentrations for maximum growth in the region of cell elongation of these seedlings; this may be due to various factors. A buffer medium with pH as near as possible to that of the tissue of the plant being tested is important in determining the effect of cell elongation substances on the growth by cell enlargement in sunflower hypocotyls. McIlvaine's buffer solution at pH 3.6 was found to be a favorable basic medium for use with the modified *Helianthus* test.

III. The effect of different concentrations of indole-3-acetic acid on cell elongation in the hypocotyl of *Helianthus annuus* seedlings.—The zone of cell enlargement—beginning 5 mm. below the base of the cotyledons and extending about 10 mm. in 90-hour-old sunflower seedlings 45 mm. high—responded favorably within certain limits to varying concentrations of indole-3-acetic acid, the most favorable concentration being 0.2 mg. per 1,000 cc. of McIlvaine's buffer solution at pH 3.6. An inhibitory effect was observed at higher concentrations. The 48-hr. period in the modified *Helianthus* test was found sufficient if an indication of the growth effect is desired; 24 hr. is not enough because of the initial impetus indicated in every case; 72 hr. should be chosen if a definite stimulation or depression of growth is to be verified. The test has proved reliable and accurate in measuring the effects of other extracts and substances by comparing the growth in cell enlargement to the various concentrations of indole-3-acetic acid. There are 28 references.

Effect of some pure substances on plant growth, R. FORBES JONES (*Nature [London]*, 154 (1944), No. 3922, p. 828).—A note on experiments with alizarin and quinizarin sulfonic acids from which it is postulated that if auxin by some means disengages certain bonds of attachment between the proteins or components of the cytoskeleton, the various effects of auxins become more understandable.

Effects of thiourea and allylthiourea on the germination of the seed of *Striga lutea*, R. BROWN and M. EDWARDS (*Nature [London]*, 155 (1945), No. 3937, pp. 455-456).—This scrophulariaceous parasite attacks the roots of various crop plants; as with some closely allied species, the seeds germinate normally only after exposure to a stimulant produced by the host root. Of some 42 compounds tested,

only 2-thiourea and allylthiourea—promoted any germination in the absence of the host stimulant. The methods used are described, and the results are discussed as of some significance in relation to various earlier reports on the breaking of dormancy in potato buds, maple seeds, acorns, and lettuce seeds with thiourea and in the last with allylthiourea.

**Effect of adrenaline solutions on oat roots,** R. FORBES JONES and H. G. BAKER (*Nature [London]*, 155 (1945), No. 3940, p. 544).—A brief note on experiments indicating that adrenalin can inhibit growth of oats roots at concentrations as low as 0.00005 M; certain effects on cell development were also noted.

**Inhibition of mould growth by p-aminobenzoic acid and the n-butyl ester,** G. W. K. CAVILL and J. M. VINCENT (*Nature [London]*, 155 (1945), No. 3932, p. 301).—Species of *Aspergillus*, *Penicillium*, and *Byssochlamys* were used in the study reported; work by others is also briefly reviewed (21 references).

**The inhibiting effect of quinones on the growth of *Penicillium notatum*,** F. GONZÁLEZ (*Science*, 101 (1945), No. 2628, p. 494).—The quinones 2-methyl-1,4-naphthoquinone, hydroquinone, and benzoquinone revealed their inhibitory capacity against *P. notatum*—even when highly diluted. Since the second and third have no vitamin activity, it is believed that the action is a quinone function independent of vitamin capacity.

**Plant-growth substances and *Penicillium notatum*,** S. W. LEE, E. J. FOLEY, and J. A. EPSTEIN (*Nature [London]*, 155 (1945), No. 3933, pp. 333-334).—In the preliminary tests reported indole-3-acetic acid at 1:10,000 gave the quickest high titer of penicillin, but was not as active at 1:100,000; naphthalene acetic acid was more active at 1:100,000, giving a peak titer in 7 days.

**Studies on growth factor requirements of various mutant strains of *Neurospora*,** J. G. PIERCE (In *Abstracts of Dissertations, 1943-44. Stanford University, Calif.: Stanford Univ. Press, 1944*, pp. 59-60).

**The effect of indole-3-acetic acid on the dry weight of *Chlorella pyrenoidosa*,** M. A. BRANNON and H. M. SELL. (Univ. Fla.). (*Amer. Jour. Bot.*, 32 (1945), No. 5, pp. 237-238, illus. 1).—When recrystallized indole-3-acetic acid (m. p. 165° C.) at 10 and 20 p. p. m. was applied to cultures of this alga in inorganic nutrient media, it stimulated growth and the dry weight of the cells was increased over fourfold.

**Auxin in leaves and its inhibitory effect on bud growth in guayule,** P. F. SMITH. (U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 5, pp. 270-276, illus. 11).—Ether extraction of fresh guayule tissues yielded little or no auxin; when they were dried, ether-extractable auxin was consistently found. Its distribution in guayule differs from that previously described for other plants. The matured leaves yielded the largest amount on a unit weight basis; the young leaves gave less auxin, although they were much richer than the terminal buds, stems, or roots. Succulent nursery plants exhibited approximately twice as much auxin on a dry weight basis as drought-hardened plants of the same age. The growth of lateral buds followed a decrease of auxin in the stems in both transplants and plants with undisturbed root systems. By determining the diffusion rate of the guayule auxin a molecular weight of 166 was obtained, indicating that 3-indoleacetic acid is the natural auxin. Application of the latter in lanolin retarded the growth of axillary buds when applied directly to the decapitated stems. Only partial inhibition followed its application to the petioles; this appeared to result from quick abscission and poor transport through the petiole. Steam girdling of both stems and petioles resulted in immediate growth of proximally located lateral buds; this apparently shows that auxin transport from leaf to bud was prevented.

**Absorption of water by plants,** P. J. KRAMER (*Bot. Rev.*, 11 (1945), No. 6, pp. 310-355).—This comprehensive review (273 references)—considering absorption

mechanisms, factors affecting absorption, and water absorption in relation to other processes—is summarized as follows: "Intake of water apparently is brought about by two independent processes differentiated by Renner as the active and passive absorption processes. When soil moisture is abundant and transpiration slow, absorption often exceeds water loss, resulting in the development of positive pressure or 'root pressure' in the xylem. This pressure causes guttation and exudation phenomena. Since the absorption mechanism responsible for root pressure is dependent on the presence of active living cells in the roots, it is termed 'active absorption.' Some workers believe root pressure is caused by secretion of water into the xylem by the surrounding living cells. Others believe it is a relatively simple osmotic phenomenon caused by a difference in concentration of solutes in the xylem elements and in the solution surrounding the roots. Certain similarities between the conditions necessary for salt accumulation and for development of root pressure suggest that they are interrelated to the extent that the occurrence of active absorption and root pressure are at least partly dependent on the accumulation of salt in the xylem and so indirectly related to metabolic activity and the permeability of the root cells.

"During periods of rapid transpiration or when soil moisture is deficient no root pressure occurs. Instead, the water in the xylem is under reduced pressure or even tension. This increases its diffusion pressure deficit and produces a gradient of increasing diffusion pressure deficit and decreasing pressure along which water moves from the external solution into the xylem. Since under these conditions the roots act simply as absorbing organs and water intake appears to be independent of any secretory or osmotic activity of the root cells, this type of water absorption is termed 'passive absorption.'

"Active absorption ordinarily can supply less than 5 percent of the water required by a rapidly transpiring plant. It does not occur from as dry soil nor from as concentrated solutions as does passive absorption of transpiring plants. Some species never exhibit any root pressure or other evidence of active absorption. It is, therefore, concluded that the root pressure or active absorption process is of negligible importance in supplying water to plants.

"The rate of absorption of water by plants in moist soil is determined primarily by the rate of transpiration. It is affected to a lesser degree by the extent and efficiency of the root system. Important environmental factors affecting absorption of water are the available moisture content of the soil, concentration of the soil solution, soil aeration, and soil temperature."

A comparative study of the water conducting capacity and growth habits of *Juniperus horizontalis* Moench and *Juniperus virginiana* L., C. G. Eifoss (*Minn Univ. Sum. Ph. D. Theses*, 2 (1943), pp. 49-51).

Lectures on the inorganic nutrition of plants, D. R. HoAGLAND (*Waltham, Mass.: Chron. Bot. Co.*, 1944, pp. 226+, illus. 72).—The following lectures are included, with bibliographies: A survey of problems of plant nutrition (pp. 1-25), micronutrient chemical elements and plant growth (pp. 26-47), the absorption and accumulation of salts by plant cells (pp. 48-71), upward movement and distribution of inorganic solutes in the plant (pp. 72-103), the growth of plants in artificial media in relation to the study of plant nutrition (pp. 104-125), some biochemical problems associated with salt absorption (pp. 126-149), and aspects of the potassium nutrition of plants as illustrating problems of the system, soil-plant-atmosphere (pp. 150-177). Author and subject indexes are given.

Iron and manganese in relation to plant growth and its importance in Puerto Rico, E. F. HOPKINS, V. PAGÁN, and F. J. RAMÍREZ SILVA (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 28 (1944), No. 2, pp. 43-101, illus. 16).—Investigation of pineapple soils and pineapple plants growing thereon indicated that severe con-

ditions of Mn toxicity exist in Puerto Rico; though such soils do not have excessive amounts, chemical analyses have revealed as high as 130 p. p. m. of water-soluble Mn and no water-soluble Fe. It is thus necessary to spray pineapple plants with iron sulfate solution to prevent severe chlorosis and death—a common practice now in Puerto Rico. Even when chlorosis is prevented with Fe sprays, large amounts of Mn are taken up as shown by analyses of the fruits and by other peculiarities of the plants apparently associated with Mn toxicity; one of these, known as "short top," exhibits an interesting relation to light intensity. One cause of the development of high amounts of soluble Mn in the soil is the continued use of  $(\text{NH}_4)_2\text{SO}_4$ , whereby the pH is often lowered to 4.0 or less. By careful adjustment to pH 6.2 the Mn was immobilized to such an extent that the available Fe proved sufficient to antidote its toxicity as regards chlorosis; addition of organic Fe improved the condition still further. Growing common bean plants in soil was used as a rapid method of detecting conditions leading to Mn toxicity; within 10 days symptoms of chlorosis appear and the approximate severity of the condition can be determined. To study carefully the interaction of Fe and Mn on growth, extensive water culture and subirrigation gravel culture experiments were carried out with beans, tomatoes, and pineapples. Tomatoes proved more sensitive than beans and beans than pineapples to Mn toxicity because of differences in the Fe reserve in the seed or seed piece; for the same reason, considerable variation in this respect was encountered in pineapples grown from different slips.

The relationship between Fe and Mn in growth is expressed briefly as follows: Chlorosis, necrosis, sunscald, and decreased growth of the plants are strikingly associated with low Fe and high Mn, whereas increased size and weight, earliness of appearance of trifoliate leaves, tendrils, flowers, and fruits and the rate of recovery from chlorosis are markedly associated with low Mn and high Fe. The ratios of dry weights of tops to roots indicated that the tops were affected more than the roots by differences in the Fe-Mn relationship. In general the Fe : Mn ratio was the controlling factor in growth, but for each given ratio growth varied with the total concentration of Fe plus Mn. At 20 p. p. m. Mn, 2 p. p. m. Fe were sufficient to prevent phototropic movements of seed leaves of bean. This and other phenomena in respect to light led to the idea that Fe acts as a protective agent against light, and also that the interaction of Fe, Mn, and light are important determinants controlling the oxidation potential of green plants. In proper balance a normal range of the oxidation potential results; when not in proper balance too high or too low a range occurs and toxicity appears. Tentative recommendations are given for preventing Mn toxicity, and it is further suggested that much may be gained in increased yields by careful adjustment of the Fe-Mn balance within the normal range where symptoms of toxicity are not apparent. There are 37 references.

The nutrition of the carrot.—II, Grown in a fen soil, R. M. WOODMAN and H. PAVER (*Jour. Agr. Sci. [England]*, 35 (1945), No. 1, pp. 30-32).—A continuation of this study (E. S. R., 90, p. 186).

Growth and phosphorus accumulation in cotton flowers as affected by meiosis and fertilization, O. BIDDULPH and D. H. BROWN. (Wash. State Col.). (*Amer. Jour. Bot.*, 32 (1945), No. 4, pp. 182-188, illus. 7).—The daily increments of dry matter, water, and phosphate to flowers and fruits in varying developmental stages were measured to furnish a continuous history of the net gain in each fraction as these organs matured. Variations in size of daily increment of dry matter followed the events of meiosis and fertilization. Maxima occurred at approximately 9 days after microsporogenesis, 11 days after megasporogenesis, and 16 days after fertilization; well-marked minima occurred between them. The daily increments of water to the developing flowers and fruits followed the same general pattern as for dry matter, but the ratio of dry matter gain to water gain was not constant.

Calculations of the percentage of dry matter showed a gradual net hydration of the primordia up to the time of fertilization, then a more rapid hydration for about 2 weeks, after which dehydration of the fruit ensued. The daily increments of marked (radioactive) phosphate to the developing flowers and fruits were influenced to a lesser degree by the events of synapsis and syngamy; well-marked maxima and minima were absent, but gains appeared after each event. The percentage of marked phosphate delivered and that of total phosphate present (dry-weight basis) were highest in the young primordia, decreasing progressively thereafter until about 5 days before anthesis. Gains, especially in marked phosphate, were then recorded during anthesis; both fractions decreased after fertilization.

The relation of cell division to growth rate in cucurbit fruits, E. W. SINNOTT (*Growth*, 9 (1945), No. 2, pp. 189-194, illus. 2).—By combining data from a development analysis in terms of cell size with data from measurement of actual growth rates in the fruits of several inbred lines of pumpkin it was found possible to determine where growth chiefly by cell multiplication ceases and where growth chiefly by cell expansion begins. Throughout this early developmental period growth proceeds at a constant exponential rate. At the point where cell division ceases and rapid vacuolation begins, there is no change in this rate. Increase in dry weight shows the same constant progression regardless of cellular changes. It is concluded that the dominant biological individual here concerned is the organ as a whole rather than any of the cells composing it.

The growth and composition of the tops of peach trees in sand culture in relation to nutrient-element balance, D. S. BROWN (*Ohio State Univ., Abs. Doctoral Diss.*, No. 46 (1945), pp. 19-28).

Recent work on the nitrogen nutrition of yeast, R. S. W. THORNE (*Jour. Inst. Brewing*, 51 (1945), No. 3, pp. 114-126, illus. 16).—A brief summary of the author's investigations in this field.

Physiological studies on some members of the family Saprolegniaceae.—IV, Carbohydrate requirements, K. S. BHARGAVA (*Lloydia*, 8 (1945), No. 1, pp. 60-68).—When the growth of *Achlya* sp., *Brevilegnia gracilis*, *Isoachlya anisospora indica*, *Saprolegnia delica*, and *S. monica* on different carbohydrates and alcohols was measured under controlled conditions, these fungi failed to grow on media lacking carbon, and glucose, levulose, maltose, and starch proved to be the best sources. Mannose served as an equally good C source for *S. monoica* and *B. gracilis*. The utilization of polysaccharides was correlated with the ability of the organisms to hydrolyze them. These fungi were also able to utilize C present in some amino acids and proteins, but some of them were valueless as C sources. Growth substances were either absent in the sugars used or, if present, had no marked effect on the growth of the fungi.

The structure of protoplasm, II, W. SELFRIZ (*Bot. Rev.*, 11 (1945), No. 5, pp. 231-259).—Supplementing the paper previously noted (E. S. R., 72, p. 749), the author reviews more recent literature (82 references) dealing with the structure of protoplasm—viscosity, anomalous viscosity, double refraction, flow birefringence, elasticity, contractility, spirality, torsion, ductility, tackiness, thixotropy; structure—gross, microscopic, ultramicroscopic, X-ray analysis, the lateral bond; and biological applications—anesthesia, genetics, permeability, protoplasmic streaming, frost resistance.

An anatomical and cytological study of *Nephrolepis exaltata* and some of its varieties, M. A. CONLEY (*Ohio State Univ., Abs. Doctoral Diss.*, No. 46 (1945), pp. 39-46, illus. 6).—On the Boston fern and other varieties of the wild sword fern *N. exaltata*.

Estudio de algunas quimeras vegetales [Study of some plant chimeras], S. E. PALMA (*An. Inst. Fitotec. Santa Catalina*, 4 (1942), pp. 75-103, illus. 41).—

This investigation concerns types of variegation observed in plants of the genera *Citrus* and *Ligustrum*.

Construction of the shoot apex in cereals and other grasses, B. C. SHARMAN (*Nature [London]*, 155 (1945), No. 3932, pp. 291-292, illus. 1).—The reawakening of interest in the developmental anatomy of the shoot apex has been paralleled by considerable advances in technic and by a growing realization that the answers to many genetical problems are locked up in a better understanding of the processes at work during the ontogeny of the organism. Present knowledge on the subject is briefly summarized.

The anatomy of leaf abscission and experimental defoliation in guayule, F. T. ADDICOTT. (Univ. Calif.). (*Amer. Jour. Bot.*, 32 (1945), No. 5, pp. 250-256, illus. 16).—Leaf fall from guayule in the field is considered a modified type of abscission. The abscission layer is not directly involved in the separation of leaf from stem; separation is mechanical and occurs after the leaf dies by a break passing through the weak abscission zone at the leaf base. There is no indication of physiological action, such as the digestion of the middle lamellae, or cells. Protection for the stem is provided by the abscission layer and the periderm which develops beneath it. The abscission layer forms at the leaf base in cortical parenchyma, resin canal plugs, and within the leaf trace; it is continuous with the periderm of adjacent regions of the stem and is well suberized before leaf fall. Cells of the abscission layer developing within the leaf trace resorb and replace the vessels for a short distance, and a phellogen appears immediately beneath the abscission layer about the time of the leaf dies. Defoliation in the flash-drying process is accomplished by a break passing across the cells of the abscission zone after the tissues have been made brittle by dehydration. Defoliation by the flash-boil method apparently results from the softening of the middle lamellae; when leaves are removed by this treatment the break passes between the cells.

Observations on spiral grain in timber, J. H. PRIESTLEY (*Amer. Jour. Bot.*, 32 (1945), No. 5, pp. 277-281, illus. 9).—As a result of studying certain cases of spiral grain in hardwood trees (*Sambucus nigra*, *Syringa vulgaris*, *Castanea sativa*), fundamental differences were found between the structural features in softwoods and hardwoods. In the latter, spiral grain results from a twist to the trace system and cambium cylinder in the primary axis; the spiral inclination thus given to all secondary vascular elements persists throughout radial growth and is therefore accentuated each year by the geometrical results of expanding the spiral with the increasing girth of the woody axis, though the files of wood elements still complete the circuit of the axis in the same longitudinal distance.

By contrast, in softwoods the so-called spiral course of the wood elements is really fictitious. In the first year wood the grain is always straight, the inclined course of the wood elements arising during the second or later years; it is due to a tilt given to the cambium initials, which results in the originally vertical elements in the radial files becoming tilted but not otherwise altering their position. There is no sense in which any file of elements, traced longitudinally, completes a circuit of the axis; the gradual change in tilt of the elements—occurring in later years—has no direct connection with the increasing girth of the axis. On the other hand a close correlation exists between the so-called spiral grain in the softwood and the eccentricity in the radial increment. The position of maximum thickness in any eccentric cylinder of wood added to an upright softwood axis has recently been shown to follow a spiral course along the length of the axis, and it is indicated that this phenomenon adequately accounts for the development of a tilt in the fusiform initials of the cambium. If the position of maximum thickness follows a left-handed spiral course in the axis, the tilt imparted to the wood elements gives the appearance of left-handed spiral grain; if the position of maximum

thickness follows a right-handed course the tilt to the wood elements suggests a right-handed spiral grain. To assist in a fuller realization of the fundamental differences, it is suggested that it would be helpful to restrict the term "spiral grain" to the phenomenon in hardwoods and describe the grain now called spiral in the softwoods as "tilted grain."

## GENETICS

**One- or two-dimensional action of mutant loci?** R. B. GOLDSCHMIDT. (Univ. Calif.). (*Amer. Nat.*, 79 (1945), No. 781, pp. 97-103, illus. 1).—A theoretical discussion of the interaction of genes.

**Luther Burbank's plant contributions,** W. L. HOWARD (*California Sta. Bul.* 691 (1945), pp. 110, illus. 4).—As a result of years of studies of all available sources of information—books, magazines, newspapers, and people—the author has brought together in systematic form a catalog of the plant contributions of Luther Burbank. According to this account, Burbank introduced over 200 varieties of fruits, as well as many ornamental and agronomic plants. Plums were his greatest contribution, and 20 of his varieties are still widely planted. Ten of these are standard shipping varieties wherever Oriental-type plums are grown, as in California, South Africa, Argentina, and Australia. In California they form the basis of a major industry, with upward of two million trees.

**Some uses of statistical methods in plant breeding,** F. R. IMMER. (Minn. Expt. Sta.). (*Biometrics Bul.*, 1 (1945), No. 2, pp. 13-15, 28).—A critical review (24 references).

**A comparison of the effect of colchicine applications on plants and seeds,** A. F. YEAGER and W. P. HAUBRICH. (N. H. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 251-254, illus. 1).—Plant materials were treated with colchicine by the immersion method, by applications in agar, by injection, in lanolin paste, and in single drops applied to the growing tip. Both the agar and lanolin treatments proved negative. Injection of Egyptian onion bulbs caused distortion and enlargement of the guard cells, but the onions grown from the top sets were normal. Immersion of the growing tip of various plants caused some injury, and of the total of all treated only two tomatoes showed polyploidy as indicated by stomatal measurements. Yet their pollen was normal and their seed produced normal diploids.

Seed treatment of various vegetables and ornamentals was successful in producing polyploidy in certain species and negative in others. A total of 24 lilac, 4 low bush blueberry, 3 peppers, 2 squash, and 1 watermelon seedlings were influenced by colchicine as evidenced in their rough appearance and enlarged guard cells. The affected pepper, squash, and watermelon plants were grown to maturity and produced abnormal pollen, confirming their polyploid state. The lilac results were outstanding with 24 polyploids from 850 seedlings.

No polyploidy was obtained in browallia, columbine, iris, mulberry, and the garden stock. Including all seedlings treated there was 1.167 percent of polyploids. Seed treatment is believed to be the most practical method for inducing polyploidy.

**Genetics of sesame,** D. G. LANGHAM (*Jour. Hered.*, 36 (1945), No. 5, pp. 135-142, illus. 6).—Genetic types described in *Sesamum indicum*, with notes on their mode of inheritance as indicated by  $F_1$  and  $F_2$  progeny tests, include glabrous leaves ( $g$ ); number of foliar glands; variation in number of leaves, capsules, and number of rows of seeds per node; and absence of glands on dorsal surface of the leaves ( $s$ ), completely correlated with tetracarpellate fruits.

**The *Ga* gene as a means of reducing contamination of sweet corn,** H. S. PERRY (*Jour. Hered.*, 36 (1945), No. 5, pp. 131-134, illus. 1).—The gene *Ga* was substituted

for *ga* in one of the parents (Purdue 51) of the sweet corn hybrid Golden Cross Bantam to produce a slightly modified Golden Cross Bantam hybrid of the genotype *Ga ga*. In such modified hybrids the presence of *Ga* instead of *ga* has been found to eliminate about three-fourth of the naturally occurring contaminations by wind-borne pollen of starchy field corn. It is believed that it would be possible by the use of certain technics to bring about a larger reduction in starchy contaminations than was obtained in the current experiment. Most, if not all, present varieties of sweet corn are the genotype *ga ga*.

"Bolters" in potatoes, P. T. THOMAS (*Nature [London]*, 155 (1945), No. 3930, p. 242, illus. 1).—On the basis of studies briefly outlined, it is believed probable that the mutation is due to production of a chromosome fragment observed in the bolter form at meiosis.

A comparison of six tomato varieties as parents of  $F_1$  lines resulting from the fifteen possible crosses, T. M. CURRENCE, R. E. LARSON, and A. A. VIRTANEN (Minn. and R. I. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 349-352).—In 1943 a test was conducted cooperatively by the Minnesota and Rhode Island Experiment Stations to study the productivity and general desirability of a number of  $F_1$  tomato hybrids and to compare the combining capacities of five established varieties and one unnamed selection. Six varieties were crossed in all possible combinations and the 15 crosses and 6 parents were grown in randomized blocks at St. Paul, Minn., and Kingston, R. I. At St. Paul, Earliana exceeded all other parents in the yield of progeny with a mean difference of  $1.64 \pm 0.44$  tons per acre between it and the next best parent. Pritchard  $\times$  Earliana was slightly more productive than any other cross and significantly so with four exceptions. At Kingston, the best general combining capacity was shown by Rutgers, but Bonny Best was not significantly lower. The highest yielding cross was Rutgers  $\times$  Pritchard.

An outstanding feature of the study was the difference in crosses at the two locations, Rutgers, for example being a poor parent at St. Paul and the best at Kingston. It was evident that the better yielding varieties at a given location will likely produce the better yielding hybrids for that locale. Certain varieties, such as Pritchard, may have wide adaptability as parents of hybrids. There is evidence that hybrids may be commercially profitable.

The response of three  $F_1$  lines and ten strains of tomatoes to two distinct soil types, R. E. LARSON and W. L. MARCHANT. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 341-347).—Nine varieties of tomatoes plus one greenhouse selection and  $F_1$  hybrid tomatoes were grown on randomized triplicated plots on two soils, a Merrimac fine sandy loam and on a relatively heavy loam, Bernardston. The same fertilizer treatment was used throughout, namely, 1,500 lb. of a 5-8-7 material plus 8 tons of manure per acre. Cultural treatments were the same.

Early yields were significantly larger on the Merrimac soil, and average fruit size, total yields, and marketable yields were significantly larger on the Bernardston soil. Certain of the  $F_1$  lines and other varieties did not respond alike to the two soil types, suggesting the probability that tomatoes may have to be developed for particular soils. All three  $F_1$  lines responded well on the Bernardston soil. The calculated cash returns from the  $F_1$  lines ranged from \$77 to \$249 more per acre than the best horticultural variety.

A polyploid watermelon, P. L. HAWTHORNE. (La. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), p. 348).—An unusual plant observed in a commercial field possessed very large runners, broad heavy foliage, and pollen grains and staminate and pistillate flowers about double the size of those of ordinary plants. The plant showed marked resistance to anthracnose leaf spot. Crosses were made

with this unusual plant and wilt resistant kinds. Where pollen of the polyploid plant was used on other varieties no fruits were obtained. Three melons containing about two-thirds the usual amount of seed were obtained by crosspollination. The resulting seed germinated poorly, and the surviving plants exhibited only a portion of the vigor and anthracnose resistance of the mother plant. Attempts to inbreed the pistillate blooms gave poor results. The few seed produced germinated, but were too weak to survive.

**Texas cantaloupe resists aphids, downy mildew, S. S. IVANOFF.** (Tex. Expt. Sta.). (*South. Seedsman*, 8 (1945), No. 2, pp. 11, 28, illus. 3).—This new cantaloup of Hale Best type—developed by the Texas Station and known as Texas Resistant No. 1—is said to be a good shipping variety, outyielding others, having fruit of high quality, and staying green longer, in addition to its high resistance to both aphids and downy mildew.

**Peach breeding in relation to winter chilling requirement, J. W. LESLEY.** (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 243-250, illus. 1).—Based on 17 yr. of investigations at Riverside, Calif., on the breeding of peaches that require relatively little winter chilling to break the rest period, the author concludes that chilling requirements depend on multiple genes, of which some are probably intermediate. It is suggested that in a wild race homozygous for long-chilling genes, a mutant gene tending to reduce chilling requirement would be more favored by natural selection if the mutant type were intermediate than if it were recessive. In the investigations covered, crossing gave rise generally to a variety of phenotypes differing in chilling requirements. Apparently nearly all parents were heterozygous, and the results of crossing varied widely. Most of the offspring were similar to or intermediate between the parents in chilling requirement, but transgressive variation occurred in both directions. About three-fifths of the combined F<sub>1</sub> families were within the parental range, one-fifth had less, and the other fifth greater chilling requirements than either parent.

Out of 88 trees derived by selfing of several varieties, 40 percent had greater chilling requirement than their parent and 24 percent less. Selfing did not result usually in any loss of vigor even when continued for three or four generations.

**Inheritance of pollen sterility in some peach varieties, D. H. SCOTT and J. W. WEINBERGER.** (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 229-232).—Based on the results of examinations of the flowers of approximately 9,000 seedling peaches of known parentage developed in breeding operations at Beltsville, Md., and Fort Valley, Ga., parental varieties are classified according to the condition of the pollen of their seedlings as follows: (1) Fertile homozygous dominants, (2) heterozygous forms with fertile pollen, and (3) homozygous recessives that are pollen-sterile. Selfing was accomplished by covering large limbs with cheesecloth before any flowers opened, and crossing was done usually on trees enclosed in cheesecloth cages.

Among varieties heterozygous for pollen fertility are such well-known kinds as Elberta, Golden Globe, Halehaven, Marigold, South Haven, Valiant, Vedette, and Veteran. Chinese Cling, Halberta, and J. H. Hale are classed as homozygous recessives, and any seedling resulting from crosses involving any one of the three as a parent will have a heterozygous pollen condition. Among varieties that are pure dominants with respect to pollen fertility, as indicated by nonsegregating progenies from selfing, are Chili, Eclipse, Gold Drop, Goldeneast, Hiley, Illinois, Kalamazoo, Pallas, and Rochester.

One peach known as P. I. No. 101676 yielded all pollen-sterile seedlings when crossed with such varieties as Valiant, Vedette, Fireglow, and Canadian Queen.

**The comparative fertility of mares bred at foal and non-foal heat, W. G. STEVENSON** (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 5, pp. 126-130).—

There was no essential difference in the percentage of conceptions of mares bred during foal heats, averaging 10.2 days after parturition, as contrasted with services in non-foal heats of which 68.4 percent conceived.

**Observations on the characteristics of the semen in relation to fertility in the bull**, J. A. LAING (*Jour. Agr. Sci. [England]*, 35 (1945), No. 1, pp. 1-24, illus. 25).—The character of the semen was compared with the service rate—number of services per conception—of 21 dairy bulls. The animals could be divided into a higher fertility group, with service rates from slightly more than 1 to about 3.5, and a lower fertility group, with service rates from above 3.5 to  $\infty$ , on the basis of density of semen, total number and motility of spermatozoa ejaculated, and change in the pH of the semen on incubation at 37° C. Totally sterile animals could be detected, but no relationship was observed between the percentage of abnormal spermatozoa ejaculated and the service rate. Standards for use in diagnosis of fertility are suggested. The paper is presented in sections on the relationship to fertility of the density and volume of the semen and the total number of spermatozoa ejaculated, the evaluation of the quality of bovine semen, and the percentage of abnormal forms of spermatozoa and fertility.

**Observations on the effect of method of management at mating on bovine fertility**, J. A. LAING (*Jour. Agr. Sci. [England]*, 35 (1945), No. 1, pp. 25-29, illus. 1).—The fertility of a group of cows was consistently better, except in December, January, February, and March (when there was no difference), when service was free than when it was controlled. Differences in fertility between the two groups was correlated with the varying length of the estral periods. The higher fertility of the free service group was due to a closer relationship of services to the end of heat and thus to ovulation. The observations were made on the services of seven Guernsey and seven Shorthorn bulls mated with cows of these breeds.

**Induced ovulation and heat in anoestrous sheep**, J. HAMMOND, JR. (*Jour. Endocrinol.*, 4 (1945), No. 2, pp. 169-180).—In continuing investigations of the effects of hormones on heat and ovulation in sheep (E. S. R., 88, p. 616), the ovaries were examined in 90 anestrous ewes, mostly Suffolk or Suffolk-Hampshire crossed with Border Leicester-Cheviots. These were previously treated with mare serum gonadotropin and stilbestrol separately or together. Search was made for the presence of ova. Treatment with serum gonadotropin alone caused ovulation, but no ewes came into heat and none of them showed the presence of fertilized ova even though the ewes were allowed to mate with an ochered ram. Ovulation was induced in some cases by stilbestrol alone. Stilbestrol inhibits the induction of ovulation by serum gonadotropin if given before or too soon after administration of the gonadotropin. "When both heat and ovulation occurred, their timing seemed such as to render fertilization improbable; only two fertilized ova were recovered. It appears that the interval between stilbestrol or serum gonadotropin injection and ovulation is shorter than the latent period required in the development of heat."

**Sheep breeding**, J. F. WALKER (*Chicago 9, Ill.: Breeder Pubs.*, 1945, pp. 128, illus. 4).—A popular book.

**The relation between polled and hermaphroditic characters in dairy goats**, O. N. EATON. (U. S. D. A.). (*Genetics*, 30 (1945), No. 1, pp. 51-61, illus. 2).—Study was made of the polled or horned condition and the occurrence of hermaphrodisim in the U. S. Department of Agriculture herd of Saanen and Toggenburg goats at Beltsville, Md., covering the 20 yr. 1925-44. In the Saanens the ratio was 219 polled : 63 horned and in the Toggenburgs 255 polled : 89 horned. The gene *P* is dominant to the gene for horns. Linkage between the genes for polled and hermaphrodisim is suggested. The sex ratio for both breeds was 50.7 percent ♂♂. The large excess of ♂♂ reported for goats suggests that a large proportion of

the hermaphrodites must be genetically ♀♀. Based on the theory suggested, it may be expected that a ratio of 3 polled ♂♂ : 1 horned ♂ : 2 polled ♀♀ : 1 horned ♀ : 1 polled hermaphrodite could be produced, which agreed closely with the observations. In order to eliminate hermaphrodisim from goats, matings should be made between polled and horned animals producing one-half horned progeny but with no hermaphrodisim.

**Distribution and genetics of the color phases of the red fox in Canada,** L. BUTLER (*Genetics*, 30 (1945), No. 1, pp. 39-50, illus. 3).—Data on more than 700,000 fox pelts of the Hudson's Bay Company were presented and discussed from the standpoint of the dihybrid relationships between red, cross, and silver foxes found in different provinces of Canada. The proportion of silver and cross foxes is decreasing. The ratios are consistent with the theories of Warwick and Hanson and can be explained by the operation of two factors. The recessives *a* and *b* are becoming less abundant, due either to the influx of the southern fox with its known lower frequency of *a* and *b* or to continuous selection against the silver type. The selection must operate through differential fertility or survival of silver foxes in comparison to reds and crosses.

**The rabbit ovulating factor of plant juice,** J. T. BRADBURY. (U. S. D. A.). (*Amer. Jour. Physiol.*, 142 (1944), No. 4, pp. 487-493).—Ovulation of rabbits as a result of treatment with plant juices (E. S. R., 88, p. 752) showed that the sensitivity of anestrous rabbits was increased by estrogen treatment. Evidently the ovulation factor of the plant juices caused a release of hormone from the pituitary of the estrous or estrogen primed rabbit in quantities sufficient to induce ovulation. Plant juice extracts capable of causing ovulation in rabbits were ineffective with and without follicle-stimulating extracts in causing ovulation in infantile rats. A total of 13 and 15 rats, respectively, were used in tests with two of the plant (oats) extracts. Other physiological studies were conducted on the responses of rabbits to copper acetate injections.

**The histopathology of a new type of hereditary loss of coordination in the domestic rabbit,** M. V. ANDERS (*Amer. Jour. Anat.*, 76 (1945), No. 2, pp. 183-199, illus. 17).—The histological characteristics of the nerves of 55 rabbits exhibiting the symptoms of ataxia (E. S. R., 88, p. 36) were described. The progressive failure of motor coordination was related to the neuropathological lesions demonstrated from the beginning of the disease until death of the rabbit 12 to 15 days later. Neuropathological lesions occurred first in the vestibular and cochlear nerves and nuclei and later involved the vestibular, pontine, and cerebellar nuclei and fibers, as well as certain other structures. Correlation between the neuropathological lesions and clinical abnormalities is discussed.

**Quantitative aspects of growth and oocyte production in the early prepubertal rat ovary,** D. W. SLATER and E. J. DORNFELD. (Oreg. State Col.). (*Amer. Jour. Anat.*, 76 (1945), No. 2, pp. 253-275, illus. 15).—Study of ovarian tissue from 48 albino rats from 2 days before to over 10 days after birth showed that the mean number of 160,500 ova per rat at the earliest age dropped to a mean of 23,120 by the eleventh day following birth. The drop in numbers were attributed to both atresia and transformation to follicle cells. The mean volume of the ova increased from 0.048 mm.<sup>3</sup> at 2 days before birth to 0.344 mm.<sup>3</sup> at 11 days after birth. Thus, growth of the ova was more rapid than growth of the entire rat. Formulas were derived for measuring rates of mortality and survival of the ova, and the inadequacy of the knowledge necessary for such measurements is discussed.

**The embryonic development of mutants of the Sd-strain in mice,** S. GLUECK-SOHN-SCHOENHEIMER (*Genetics*, 30 (1945), No. 1, pp. 29-38, illus. 8).—A total of 576 embryos from matings of heterozygous animals (*Sd* +) inter se and from outcrosses of heterozygotes to normals and timed between 8 and 17 days of gesta-

tion were used for studying the development of heterozygous and homozygous mutants for the dominant gene *Sd* (E. S. R., 84, p. 172). The first abnormalities were shown in the tails of the heterozygotes 10 days and the homozygotes 9 days after fertilization. There is a cell degeneration, and the hematomata formed and the entire tails are eventually resorbed. Abnormalities of the notochord and neural tube are secondary to the cell degeneration in the tail. The first urogenital abnormalities were observed in both at about 10 days after fertilization. Certain abnormalities of the urogenital system are discussed.

**Examination of the sire for fertility**, N. C. STARKE (*Jour. So African Vet. Med. Assoc.*, 14 (1943), No. 4, pp. 142-147).—Methods for examination of the semen of different classes of animals are described, including recommendations for semen collection for artificial insemination as given by Lambert and McKenzie (E. S. R., 84, p. 316).

**The plasma of developing chick and pig embryos**, D. H. MOORE, S. C. SHEN, and C. S. ALEXANDER (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 4, pp. 307-310, illus. 4).

**"Nicking" in relation to sexual maturity** of S. C. W. Leghorns, I. M. LERNER (Univ. Calif.). (*Amer. Nat.*, 79 (1945), No. 781, pp. 152-159).—An analysis of a series of 31 diallel sets of matings producing an adequate number of pullets indicated that nicking or nonadditive deviations in general do not play an important part in the determination of sexual maturity. This trait was found to be from 16 to 33 percent heritable. Assuming the absence of sex-linkage and of nonhereditary maternal effects, twice the variance attributable to the dam plus that attributable to interaction yields a total heritability of about 16 percent. On the other hand, if the variances attributable to all sources except the error are added up, an estimate of the genetic variance between individuals approaches 33 percent. The first is definitely an underestimate in view of the demonstrated sex-linked differentials (E. S. R., 89, p. 199), and the latter is undoubtedly an overestimate since it includes the variation between years confounded with that between sires. Assuming that the purely maternal effects are at least offset by sex-linked effects, the probable limits of individual heritability of sexual maturity are between 16 and 33 percent. The total number of sires involved in the study was 62 (31  $\times$  2), with 69 (25  $\times$  2 + 5  $\times$  3 + 1  $\times$  4) dams. There were 548 pullet progeny in the study. The total variance was partitioned into four parts—(1) due to differences between sires, (2) due to differences between dams, (3) interaction, and (4) error.

**A study of four strains of broiler chicks**, J. H. VONDELL. (Mass. State Col.). (*U. S. Egg and Poultry Mag.*, 51 (1945), No. 6, pp. 269, 281).—Comparison was made of broiler production in lots of 150 chicks from each of these strains for mortality records, weight at 8 and 13 weeks, chick feathering at 10 days and 8 and 13 weeks, shank and skin color at 13 weeks, comb size at 8 and 13 weeks, feed consumption at 8 and 13 weeks, dressed grade at 13 weeks, and feed efficiency at 8 and 13 weeks of age. The results showed that the crucial stage is the period from about 6 to 13 weeks of age. The four strains showed marked differences in desirable broiler characteristics. One strain was superior to the others in growth, feed utilization, rate of feathering, comb height, dressed grade, and profit per bird. Another strain was inferior in all of these factors except height of comb.

**The influence of inbreeding on egg weight**, N. F. WATERS. (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 318-323, illus. 2).—The influence of inbreeding on egg weight was studied in 15 inbred lines of chickens maintained at the U. S. D. A. Regional Poultry Research Laboratory. Egg weight observations were included on 1,709 Single-Comb White Leghorns during at least 1 week a month from January to May in 1939 to 1943, inclusive. There was some selection for egg weight aimed at maintaining weight above 56.7 gm., but selection was

primarily for resistance to avian lymphomatosis. The inbred lines showed different means and distributions, but with a few exceptions there was little important or permanent change in the mean egg weight of the different lines from generation to generation. If a line had characteristically larger or smaller egg weight, then all of the subsequent generations maintained this relationship. The data indicate that egg weight can be maintained above an average level of desirability by selecting dams which are above this level.

**Breeding for resistance and susceptibility to avian lymphomatosis, N. F. WATERS.** (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 3, pp. 259-269, illus. 2).—Continuing studies noted on page 625, the findings for 5 yr. of selective inbreeding in chicks for resistance and susceptibility to lymphomatosis are presented. The foundation chickens, all White Leghorns, were introduced as hatching eggs from widely separated geographic regions. Within 15 lines, it was possible to show progressive increases and decreases in the occurrence of the disease. Although all selection was from the foundation stock and their descendants, with sanitary and quarantine measures which prevented the introduction of all parasites except coccidia and all infectious diseases common to chickens, this did not prevent lymphomatosis being introduced. About 60 percent of all birds of the first four generations were dead at the end of a 600-day period. About one-half of this loss was due to lymphomatosis, and the other half to various causes. The occurrence of lymphomatosis masked the effect of other diseases which affected mortality. A viability index is presented which gives consideration to the mortality factors encountered. The viability index can be used as a viability measure of the progeny of a given sire or dam or to measure the sibs of prospective breeding birds within a family.

**The influence of inbreeding on hatchability, N. F. WATERS.** (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 329-334, illus. 2).—A report is given on hatchability as it occurred in the 15 inbred lines of Single-Comb White Leghorns used in the above study, hatched from 1939 to 1944. The primary objective of the laboratory was resistance and susceptibility to avian lymphomatosis as noted above. Hatchability observations are recorded on 1,076 families. All breeding operations were limited to selection within the original chickens or their descendants from nine different flocks from widely separated geographic regions. There was continuous and intentional selection for high hatchability, and the response was more pronounced in some lines than in others. Four known embryonic recessive lethals were uncovered, and others may be present. Inbreeding naturally eliminates recessive lethals. The results demonstrate that it is possible to practice selective inbreeding and at the same time maintain a safe level of hatchability. The most intense inbreeding practiced has progressed to the fourth brother-sister generation with no pronounced decrease in hatchability.

**Breed differences in yolk defects of fresh eggs, F. P. JEFFREY.** (N. J. Expt. Stas.). (*Poultry Sci.*, 24 (1945), No. 3, pp. 241-244).—An examination of 21,927 opened eggs showed that the defect termed "blemished yolk" and another defect in which fragmented yolk was mixed with the albumen were limited to the Barred Plymouth Rock and Rhode Island Red breeds. No such defects were observed in eggs from Single-Comb White Leghorns or Legbars.

**More superior sires in poultry revealed by "double shift," F. B. HURR.** ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 3, pp. 13-14).—A double shift is suggested so that cockerels may be tested with different groups of hens for 4-week periods. By this method the number of pens necessary is reduced. It requires 1 week's interim in order to be assured of the paternity of the birds, so that suitable sire tests may be conducted on the progeny.

**Improving the flock by progeny testing.** P. D. STURKIE (*New Jersey Sta. Hints to Poultrymen*, 32 (1945), No. 3, pp. [4]).—At least eight, and preferably more, daughters per dam should be tested for egg production, egg size, and viability. The records should be as complete as possible to evaluate properly the breeding worth of the dam and her sibs. Inbreeding and line breeding are suggested for concentrating superior stock. Crossing is also suggested for the better inbreds in order to produce superior families.

**The primary sex ratio in domestic chickens.** F. A. HAYS. (Mass. Expt. Sta.). (*Amer. Nat.*, 79 (1945), No. 781, pp. 181-186).—The sex ratio at hatching among 870 chicks was found to be 49.7. There were variations in the 10 years' data reported for the progeny of 11 hens, but great variation in the primary sex ratio between different families was observed, which may be traced to gene differences. Sex in the domestic chicken may depend upon many genes which are located in the autosomes, thus causing the differences between the equality of the sexes when the progeny of several parents are included.

**A technique for the sex determination of chicks.** T. H. CANFIELD (*Minnesota Sta. Misc. Rpt.* 3 (1944), pp. 8, illus. 6).—Details for sexing chicks at hatching are described and illustrated.

**The relation between heredity, sexual activity, and training to dominance-subordination in game cocks.** R. A. FENNELL. (Mich. State Col.). (*Amer. Nat.*, 79 (1945), No. 781, pp. 142-151, illus. 1).—The dominance-subordination and social organizations were determined in game chickens by factors which on final analysis were closely related to the hereditary background of the individual. Courage, aggressiveness, and shiftness, all of which are important in domination-subordination, are hereditary, as these characteristics are exhibited to a greater degree in game than in the common domestic fowls considered. The expression of these latent hereditary characteristics may be aided by other factors such as training, isolation, and sexual activity. Identical environmental factors seem to exert less effect in directing the behavior pattern toward the dominance in other breeds than in game chickens.

**The accuracy of the macroscopic method in identifying fertile unincubated germ discs.** I. L. KOSIN (*Poultry Sci.*, 24 (1945), No. 3, pp. 281-283, illus. 3).—In 303 yolks examined, 60.1 percent were judged before incubation as containing fertile disks by methods previously described (E. S. R., 92, p. 38). After incubation 58.4 percent of the disks showed definite signs of development.

**Relation of time of day of artificial insemination to fertility and hatchability of hens' eggs.** J. E. PARKER. (Tenn. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 314-317).—A total of 107 inseminations were made at three different times of day—6:30-7 a. m., noon, and 5:30-6 p. m. There was a pronounced reduction in fertility when hens were inseminated in the morning. Hens inseminated in the late afternoon produced a slightly higher percentage of fertile eggs than those inseminated at noon, but the difference was not statistically significant. Hatchability of fertile eggs was significantly higher in the afternoon-inseminated group than in the morning or noon group. Hens with hard-shell eggs in the uterus at the time of insemination produced a lower percentage of fertile eggs than those with no eggs or a "soft" egg in the posterior region of the oviduct. Fertility and hatchability were highest in the soft-egg group. According to these results, restricting mating of chickens to the afternoon would seem to increase both fertility and hatchability.

**Reduced pituitary activity from the influence of sex hormones.** E. H. HERRICK and I. W. HARTMAN. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 47 (1944), No. 2, pp. 187-189, illus. 1).—Since the gonads of fowls treated with sex hormones become smaller, study was made of the influence of the treatment with the ♂ sex hormone (testosterone propionate), ♀ sex hormone (estrone), and a synthetic estro-

genic compound (diethylstilbestrol) on the pituitary gland. Injections were made with each of these three hormones on groups of 10 ♂ Single-Comb White Leghorn chickens with another group of untreated chicks for controls. The treated birds received 22 daily injections of a total of 44 mg. of ♂ sex hormone, 5.5 mg. of estrone, or 11 $\frac{1}{2}$  mg. of diethylstilbestrol per bird. The birds were 105 days old at the conclusion of the experiment, and the testes were removed and the pituitaries assayed by implantation of two pituitaries of the breast muscle of 7-day-old ♀ chicks. The testes of the birds that had received each of the three hormones were smaller than the testes of the untreated controls. The ovarian weights of the assay chicks and the percent of follicles over 50 $\mu$  in diameter were less in chicks implanted with pituitaries from ♂♂ treated with the several hormones than from the untreated controls.

A re-investigation of the development of the wing of the fowl, W. MONTAGNA. (Cornell Univ.). (*Jour. Morphol.*, 76 (1945), No. 2, pp. 87-113, illus. 12).—Details are presented on the anatomy of the wing during development of 80 embryos selected from 150 embryos from the fifth day of incubation to hatching. An extensive bibliography is included.

A report on the observation of a one lung condition in chicks, J. O. Foss, A. I. GOLDSBY, and J. V. MILES. (N. Dak. Expt. Sta. et al.). (*Poultry Sci.*, 24 (1945), No. 3, p. 284, illus. 1).—Dissection of the respiratory systems of two chicks showed the right lungs to be missing, and that one had a small bud or embryonic lung and the other had a short extending process of the trachea. The finding of three chicks in one flock with the same type of malformation suggests a common cause, but no explanation is offered for it.

Effects of X-rays upon flecking in the domestic pigeon, L. J. COLE and H. E. FINLEY. (Wis. Expt. Sta. et al.). (*Physiol. Zool.*, 18 (1945), No. 2, pp. 167-175, illus. 15).—"Flecking" is the term used for the appearance of irregular patches of recessive color on a background of dominant color in pigeons heterozygous for the two colors concerned. It is attributed to mutation of the dominant gene in the cells of the feather germ. The number and extent of the flecks in feathers subsequently regenerated after removal from the wing can be increased by exposure to X-ray dosages of 750 r. (roentgens) and 1,000 r. Such increase in flecking not only occurs in the first feathers regenerated after removal, but persists with a generally increased intensity in feathers later regenerated from the same follicle. The emergence of the new feathers is first delayed as the result of the treatment, but thereafter regeneration is practically as rapid as under ordinary conditions. It is concluded that the X-rays increase the frequency of the changes normally occurring in the feather germs of pigeons of the genotypes concerned.

## FIELD CROPS

A new method of performing field trials, B. G. CAPÓ (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 28 (1944), No. 1, pp. 22-34).—A new method of performing field experiments with relatively small numbers of treatments is described, the requirement to be fulfilled by layouts of such field tests is specified, and examples of possible designs for a five-treatment experiment are illustrated. The theory of the procedure of calculation is discussed, and a numerical example of calculations is given in connection with the interpretation of a fertilizer experiment with cotton.

A method of interpreting the results of field trials, B. G. CAPÓ (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 28 (1944), No. 1, pp. 7-21).—The assumption of a different effect constant for every pair of adjacent plots of a randomized block field trial evidently led to greater precision in the reduction of corresponding data than assumption of a different effect constant for every different complete block

of the experiment. A method usable in this connection to reduce calculational work to a minimum for interpretation of such experiments by use of the new assumption proposed is presented. Application of this method to results of randomized block experiments already performed requires more work than application of the usual methods of statistical analysis for which the experiments were designed, although justified by increase in precision. The number of operations required for the application of the method could be reduced by specially designing field trials.

[Crop production and soil fertility] (*Illinois Sta.*, 1945, AG-948, pp. 19, illus. 20; AG-1244, pp. [4], illus. 1; AG-1246, pp. 9+; AG-1251, pp. 3, illus. 1; AG-1252, pp. 8+, illus. 1; AG-1254, pp. 5+, illus. 1; AEng-462, pp. 13+, illus. 4).—In leaflets entitled Kudzu (AG-1244), Mangel (AG-1251), and Millets in Illinois (AG-1254), all by R. F. Fuelleman, and Sunflower Seed Production in Illinois (AG-1252), by R. O. Weibel and W. L. Burlison, practical information is given on varieties, cultural methods, and management and harvesting practices. Lincoln Soybeans (AG-1246), by C. M. Woodworth and L. F. Williams (coop. U. S. D. A.), describes the origin and characteristics of the variety, behavior in comparative yield tests, composition of seed, maturity, and adaptation. In the Morrow Plots (AG-948), by F. C. Bauer and C. H. Farnham, annual yields 1888-1944 are reported with summaries covering long-time averages, corn yield trend behavior, comparative behavior of cropping and treatment practices, and economic aspects. Barn Hay-Curing Systems (AEng-462), by J. H. Ramser, deals with advantages, design, construction, and operation.

Field crop experiments at Las Vegas, New Mexico, 1937-1944, J. CARTER, JR. (*New Mexico Sta. Bul.* 321 (1945), pp. 11, illus. 3).—Alfalfa varieties, grain and forage sorghums, annual hay crops, corn, pinto beans, and range grasses (E. S. R., 83, p. 760) were tested to determine the best crops for high-altitude areas of New Mexico under limited irrigation. New Mexico Common alfalfa consistently yielded the most tons per acre, although all varieties tested maintained good stands. Fremont outyielded other sorgos, but none of the grain sorghums matured enough grain to be of commercial importance in comparison with adapted corn varieties. Siberian millet produced the greatest tonnage per acre of all annual hay crops 1937-40, and field peas and oats made the highest-quality hay. Early maturing dwarf varieties of corn have been best adapted. All pinto bean strains made good yields in the advanced test, including strains developed by the station, a local strain, Calico (a California bean), and strains from New Mexico bean growers. Strains 295 and 247 have been increased and released to growers, and strain 641 was to be increased in 1945 and distributed in 1946. The range grasses, blue grama, crested wheatgrass, and weeping lovegrass maintained stands of better than 75 percent density. Weeping lovegrass was hardy enough to withstand temperatures of -25° F.

Sodium nitrate as a supplement to farm manure and red clover, J. A. BIZZELL and E. W. LELAND ([*New York*] *Cornell Sta. Bul.* 817 (1945), pp. 8, illus. 1).—One cropping system—corn, barley, wheat, and red clover—received manure at the rate of 4 tons per acre every 4 yr. and the other corn, barley, red clover, and timothy—4 tons and 8 tons every 4 yr. Sodium nitrate was applied at the rates of 50, 100, and 200 lb. per acre to supplement the manure applications, and 200 lb. of nitrate was applied without manure. All plats received the same quantities of superphosphate, potassium chloride, and ground limestone. Larger yields resulted from sodium nitrate with farm manure than from manure alone. In the clover rotation the increases were small, while in the clover-timothy rotation, supplemental nitrate produced significant increases, although total yields of grain in the clover rotation were the larger. Sodium nitrate, 200 lb. per acre with manure, resulted in larger crops than did 4 or 8 tons of manure used alone. Corn yields were largest in the rotation omitting timothy. Since depressing effects of the timothy on corn were

not followed by correspondingly larger yields of other crops in the rotation, timothy was a permanent disadvantage in the cropping system. Beneficial effects of sodium nitrate were confined to crops for which it was immediately applied.

The effects of clipping bluestem wheatgrass and blue grama at different heights and frequencies, C. E. HOLSCHER. (U. S. D. A. coop. Mont. Expt. Sta.). (*Ecology*, 26 (1945), No. 2, pp. 148-156, illus. 4).—Neither bluestem wheatgrass nor blue grama could endure the degrees of clipping practiced in studies near Miles City, Mont., 1938-42, even with favorable weather, without decline in vigor and gradual deterioration. Utilization by livestock obviously must be less severe if ranges are to be maintained at a level of maximum production. Under proper grazing a certain percentage of plants evidently should remain unused each year so that the vigor may be rebuilt in plants closely grazed in previous years.

How new varieties of small grains are produced, R. W. WOODWARD (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 2, pp. 6-7, 16).—A description of methods in general use in systematic breeding of new and improved cereal varieties including introduction, selection, and hybridization followed by selection. Some of the varieties of wheat, oats, and barley developed by these methods and grown in the region are mentioned.

Investigations in *Triticum-Agropyron* hybridization, J. M. ARMSTRONG (*Empire Jour. Expt. Agr.*, 13 (1945), No. 49, pp. 41-53).—Intergeneric hybridization of wheat and certain species of *Agropyron* by the Division of Forage Crops, Central Experimental Farm, Ottawa, Canada, has proceeded along the lines of line-breeding, back-crossing, and creation of allopolyploids. The compatibility of various crossing combinations evidently can best be evaluated by the fertility of  $F_1$  hybrids, and this in turn is determined by the degree of homology of the chromosome sets. Four generations of line-breeding have resulted in the gradual increase of fertility, seed weight, and percentage of perennial plants in the selected lines. Selection also has been for agronomic characters that constitute good forage types. Back-crossing, although involving more difficulties than line-breeding, is the most promising method of improving the grain quality of the hybrids. A striking advance in the work has been the creation of amphidiploids in the wheat  $\times$  *A. glaucum* hybrids. Use of colchicine for inducing chromosome doubling has created in a single step new forms which are more stable and promising than those obtained from years of line-breeding.

Abstracts on the utilization of straw, M. E. WHALLEY (*Ottawa: Natl. Res. Council Canada*, 1944, pp. 442+, illus. 1).—The agricultural and industrial utilization of barley, flax, oats, rye, and wheat straw is dealt with in 846 abstracts of articles and 353 patents, including the year 1943. The abstracts are arranged alphabetically and a comprehensive subject index is appended. The patents are listed chronologically with subject and patentee indexes, as well as a numerical patent index by countries.

Arizona range resources and their utilization.—I, Cochise County, R. A. DARROW (*Arizona Sta. Tech Bul.* 103 (1944), pp. 309-366, illus. 11).—Appraisal of the forage resources of Cochise County revealed a need for balanced livestock and forage production. The forage inventory (1929-43) consisting of estimates of grazing capacity on range lands, of forage derived from croplands and pastures, and of out-of-county forage and supplementary feed, showed a total forage supply from these sources approximating 83,000 animal units. Current livestock populations indicated by U. S. Census data are somewhat in excess of this estimated grazing capacity of the county as a whole and suggest a need for balancing livestock numbers against forage sources on range and pasture lands. The inventory revealed that the present forage productivity of most vegetational types is considerably below potential capacity through past overutilization by livestock. Measures to

obtain increased forage production, outlined for each type comprise desirable species and methods for artificial revegetation, noxious shrub control methods, and improved management practices. Methods of balancing forage and livestock production in the county are outlined. A guide to the proper stocking rates is presented in the form of grazing capacity data and indicators of satisfactory and unsatisfactory range condition for each vegetational type.

The competition between barley and certain weeds under controlled conditions, H. M. MANN and T. W. BARNES (*Ann. Appl. Biol.*, 32 (1945), No. 1, pp. 15-22).—No special relationship was observed (in pot experiments) between barley and either spurry (*Spergula arvensis*) or scentless mayweed (*Matricaria inodora*), dominant annual weeds at Woburn on most of the plots where barley has been grown since 1877. The effect seemed to be only one of competition for root space or for N when not in excess.

The Scottsbluff Pinto bean, J. H. JENSEN (*Nebraska Sta. Cir.* 78 (1944), pp. 6, illus. 1).—Scottsbluff Pinto, a bean produced by crossing the common pinto with Great Northern, is described as a valuable early pinto adapted to western Nebraska under both dry-land culture and irrigation. Its earliness, vigor, yield, and quality are of sufficient superiority to commend it to Nebraska growers, although it has no notable disease resistance.

Ladino clover for western Oregon, H. A. SCHROTH. (Coop. U. S. D. A.). (*Oregon Sta. Cir.* 161 (1941), pp. 12, illus. 2).—Practical instructions on growing Ladino clover cover adaptation; seeding, fertilizer, irrigation, and management practices; and using the crop for pasture, hay, and seed.

Thin stands of corn produce bigger ears but lower yields than thicker plantings, L. L. HUBER (*Pennsylvania Sta. Bul.* 464, Sup. 2, [1945], p. 10, illus. 1).—Corn yields obtained in several counties from different spacings on land of different fertility levels showed that for more efficient production growers should use a planting rate adapted to the soil productivity of the farm.

Nitrate of soda as a fertilizer for corn, C. A. MOORE (*Tennessee Sta. Bul.* 196 (1945), pp. 16).—Corn continuous on Lintonia silt loam receiving P and K at Jackson (1931-44) without NaNO<sub>3</sub> averaged 17.2 bu. per acre and receiving P, K, and NaNO<sub>3</sub> 100 lb. per acre 29.0 bu. In another series corn, 1927-36, averaged without NaNO<sub>3</sub> 21.4 bu., with 120 lb. NaNO<sub>3</sub> 33.7, and 160 lb. 36.7 bu. On a gray soil at Murfreesboro corn without NaNO<sub>3</sub> averaged (1920-27) 27.8 bu., with 80 lb. NaNO<sub>3</sub> 29.3 bu., 120 lb. 30.8, 160 lb. 31.9, and 200 lb. 31.3 bu., the small increases being attributed to subsoil conditions. On recently cleared land on the Cumberland Plateau, chiefly Hartsells fine sandy loam, corn in tests by J. J. Bird made little response to NaNO<sub>3</sub> 100 to 200 lb. the first year, some response (especially to 200 lb.) in the second year, and excellent responses to both rates in the third year. When 100 lb. was applied to corn at five stages on representative uplands, yields averaged for NaNO<sub>3</sub> at planting 25.9, ankle-high 26.7, knee-high 28.7, waist-high 28.3, and at tasseling 24.5 bu., and without NaNO<sub>3</sub> 19.2 bu. On most Tennessee soils, only 100 to 150 lb. per acre seemed advisable, with 160 lb. indicated as the limit of profitable application. Adjustment of stand to soil fertility and the relative merits of different N carriers are discussed briefly.

1942 experimental hybrid corn trials in Illinois, G. H. DUNCAN, O. E. BOLIN, and C. M. WOODWORTH. (Coop. U. S. D. A. and Ill. Nat. Hist. Survey). (*Illinois Sta.*, 1942, AG-1128, pp. 7).—A summary report is made on experimental hybrid corn tests by the station 1939-42. Two-, 3-, and 4-yr. averages are presented for results in northern Illinois (DeKalb and Ogle Counties), in central Illinois (Champaign County), and in southern Illinois (Madison County). See also notes on the 1941 (E. S. R., 87, p. 53) and 1943 (E. S. R., 91, p. 28) tests.

**Illinois hybrid corn tests, 1944.** G. H. DUNGAN, J. H. BIGGER, A. L. LANG, B. KOEHLER, and O. BOLIN. (Coop. U. S. D. A. and Ill. Nat. Hist. Survey). (*Illinois Sta. Bul.* 509 (1945), pp. 453-484, illus. 1).—Acre yields and other agronomic characters are reported for 237 corn hybrids grown in 1944 on seven fields and 9 grown on soils of two fertility levels. Sullivan test field had the highest average yield, 91.6 bu. per acre, and the upland field at the Dixon Springs Station at Robbs the lowest, 22.0 bu. The seven fields averaged 66.2 bu. per acre compared with 45 bu., the State average. The same 9 double-cross hybrids on the same farm at Urbana averaged 109.8 bu. per acre on highly productive soil and 54.8 bu. on medium-productive soil. The few white hybrids tested in northern and north-central Illinois did not yield well in comparison with the yellow hybrids, but in south-central, southern, and extreme southern Illinois a number appeared to be very well adapted.

Chinch bugs damaged corn more than any other insect in 1944. Records for the Sullivan field show that from 4.3 to 45.7 percent of the plants lodged 30 degrees or more from the feeding of the corn rootworm, although comparatively few hybrids developed the more severe lodging. Appreciable amounts of lodging due to European corn borer attack were found on both Mt. Morris and Milford fields, but there was considerably less lodging at Mt. Morris. Corn earworm feeding was severe at Dixon Springs, the comparatively high percentage of damaged corn being due to ear rot fungi which invaded kernels injured by earworms. Losses from diseases were about average in 1944, no one disease being especially outstanding. Seed of 18 hybrids treated with an organic sulfur compound gave yields 3.2 bu. an acre above the average of untreated seed. Damage from kernel rot in these 18 hybrids ranged from 3.7 to 7.72 percent.

**Cotton variety tests in the Rio Grande Valley of New Mexico, 1940-1943.** A. R. LEDING and L. R. LYTTON. (Coop. U. S. D. A.). (*New Mexico Sta. Bul.* 319 (1944), pp. 16; *Sup.* [1945], pp. [2]).—Varietal comparisons, in which yields and other agronomic characters, as well as combed length of lint, strength index, strength of 22s yarn, and equivalent staple length were obtained, involved strains of Acala, Coker, Delfos, Deltapine, Mcade, Stoneville, and Wilds. The data indicated that the present generally grown Acala 1517 variety is the most desirable for production under conditions of the Rio Grande Valley in New Mexico and the adjoining area in Texas, and that no change is currently advisable. Additional data on the 1944 test are presented in a supplement.

**The cottons of Puerto Rico.** J. B. HUTCHINSON (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 28 (1944), No. 2, pp. 35-42).—A discussion of the occurrence and distribution of varieties of *Gossypium barbadense* and *G. hirsutum* in Puerto Rico.

**Use of commercial fertilizers in cotton production.** J. J. SKINNER (U. S. Dept. Agr. Cir. 726 (1945), pp. 26, illus. 17).—A practical discussion of the nutrient requirements of cotton, the form and function of fertilizer constituents including N, P, K, and secondary and minor plant nutrients, the efficient use of fertilizer, economy of higher analysis fertilizers, tonnage of fertilizers used on cotton, and recommendations to increase yields.

Yields per acre largely determine the cost of production per pound and the profit in growing cotton, the principal cash crop of the South. In the southeastern and south central sections of the Cotton Belt the kinds and quantities of fertilizer influence yield and profit more than any other factor. Other cultural means of maintaining soil fertility and producing profitable yields are concerned with increasing acreages of legume cover crops, adopting proper rotations, and improving crop-management practices. Use of high-analysis fertilizer containing materials of low cost per unit of plant food reduces fertilizer costs, conserves bags and other materials, and saves freight, handling, and farm labor expense. Use and proper

application of improved fertilizer on improved cotton varieties, growing of winter legumes more extensively, rotation of cotton with other crops, including a summer legume, and elimination of cotton from unsuitable areas makes possible production of larger yields on fewer acres at reduced cost.

**Oil percentage through test weight**, W. E. DOMINGO. (U. S. D. A.). (*Seed World*, 57 (1945), No. 4, pp. 8-9, illus. 1).—Samples of castor-bean seed ranging from 39.0 to 48.5 lb. per bushel in test weight were found to contain from 47.1 to 55.2 percent of oil. Correlation between test weight and oil percentage was highly significant. The extent to which the easily determined datum of test weight can be used for estimating oil content of particular seed lots is limited by the fact that, in certain cases, samples with very similar test weights had quite dissimilar oil percentages.

**Dallis grass seed sources**, G. W. BURTON. (U. S. D. A. coop. Coastal Plain and Ga. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 6, pp. 458-468).—Strains or seed sources of Dallis grass from South Africa, Uruguay, Australia, and the main seed-producing areas in the United States were compared in a spaced plant test. Ten of the 24 were also evaluated in a clipped plat. Statistically significant strain differences in forage yield, anthracnose resistance, self-fertility under bag, heading date, ergot resistance, and longevity were observed. Mixtures of common and yellow-anthered types occurred in two introductions. All plants within any one of the other 22 strains were remarkably uniform in plant type. Anthracnose resistance indices were correlated very closely with longevity and stand variations, indicating that strains tend to live longer and maintain better stands than strains susceptible to this disease. A spaced plant strain test evidently will give ratings on anthracnose resistance, fall growth, longevity, and yield which may be expected to apply reasonably well when the strains are compared in a clipped plat test.

**Flaxseed production in Montana**, A. H. POST and S. C. LITZENBERGER (*Montana Sta. Bul.* 429 (1945), pp. 14, illus. 1).—Production methods recommended for high quality of flaxseed cover the place of flax in the cropping system; varieties; tillage, cultivation, and irrigation practices; flax-wheat mixtures; harvesting, threshing, and cleaning flaxseed; and diseases and insects.

**Studies on sample size and number of replicates for guayule investigations**, W. T. FEDERER. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 6, pp. 469-478).—Seven guayule varieties were planted in a replicated experiment to study the percentage of rubber for 1-year-old guayule. Component analysis studies revealed that little increase in information resulted when more than 12 plants were included in the sample. The 12-plant sample size gave like results for the three plant characters studied even though their coefficients of variation were quite different. Variation among the individual plants within a sample was high for dry weight of shrub and weight of rubber and relatively low for rubber percentage.

**A milkweed survey in Ontario and adjacent Quebec**, H. GROH and W. G. DORE (*Sci. Agr.*, 25 (1945), No. 8, pp. 463-481, illus. 8).—A report of a survey of the density and distribution of the wild stands of milkweed (*Asclepias syriaca*) (E. S. R., 90, p. 48) in the older part of Ontario and the Quebec side of the Ottawa Valley and of factors involved in the distribution pattern.

**Improvement and distribution of spring-sown red oats**, F. A. COFFMAN, E. G. HEYNE, C. O. JOHNSTON, H. STEVENS, and H. C. MURPHY. (U. S. D. A. and Idaho, Iowa, and Kans. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 6, pp. 479-498, illus. 1).—The spring-sown red oats region, which produces from 20 to 25 percent of the oats grown in the United States, extends from coast to coast across central United States, exclusive of mountain and desert areas; and includes the southern Corn Belt and southward to the Cotton Belt, overlapping the fall-sown

oat area on the south and the spring-sown on the north. Fifty years ago Red Rustproof, Burt, and northern white oats, all unadapted, were principally grown and failures were frequent.

Interest in red oats for spring seeding increased following the distribution of Kanota in Kansas in 1921. Fulghum and Kanota eventually were extensively grown throughout the area. Improvement efforts, 1918-22, resulted in production of Brunker and Trojan at Akron, Colo., and Otoe at Lincoln, Nebr., from Burt; Columbia at Columbia, Mo., and Franklin at Columbus, Ohio, from Fulghum; and Frazier from Red Rustproof at Denton, Tex. By 1940 Columbia had become a leading variety in central United States. Need for rust- and smut-resistant red oats resulted in initiation of hybridization efforts in 1926. While no rust-resistant varieties were released, Fulton, smut resistant, was distributed in Kansas in 1939.

The crown rust resistance introduced from the South American Victoria was discovered at Manhattan, Kans., and confirmed at Ames, Iowa, in 1929. Numerous crosses with Victoria were effected in 1929 and 1930. From Victoria  $\times$  Richland the Corn Belt oats Boone, Cedar, Control, Tama, Vicland, and Vikota resulted. Fultex, from the Victoria-Fulghum cross, grown from spring as well as fall seeding in north Texas, is too late for growing farther north. The crown rust resistance of Bond was discovered at Ames, Iowa, in 1931, and numerous crosses were made in 1932 and later.

The more promising strains evolved from crosses made in 1926 were crossed in 1935 with Victoria-Richland derivatives to obtain oats resistant to rusts and smuts. Certain resulting selections are early maturing, rust and smut resistant, and yield well in the area here outlined and also farther north. Of these, Ventura was distributed in California in 1944 and Osage and Neosho in Kansas in 1945. Since 1935, crosses have been made to add disease resistance to Columbia and also to combine in otherwise desirable, adapted oats resistance to stem rust races 8 and 10.

Comparatively satisfactory rust- and smut-resistant oats adapted to the area have been produced and distributed as a result of the breeding program begun about 25 yr. ago, and present efforts are focused on correcting existing deficiencies with indications of a reasonable degree of success.

The behavior of four varieties of peanuts as affected by calcium and potassium variables, G. K. MIDDLETON, W. E. COLWELL, N. C. BRADY, and E. F. SCHULTZ, JR. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 6, pp. 443-457, illus. 4).—Response of Virginia Bunch, North Carolina Runner, Spanish 2B, and White Spanish peanuts to Ca and K was investigated on soils low in these elements. Fertilization treatments superimposed on each variety were no treatment, gypsum, gypsum plus K, and limestone plus K. Significant interactions for varieties  $\times$  treatments were obtained when measured either in terms of yield, true shelling percentage, or percentage of ovarian cavities filled. A pronounced difference was noted in varietal requirements for Ca, Virginia Bunch having the highest requirement and White Spanish the lowest. At one location, yield of Virginia Bunch was increased nearly sixfold by application of gypsum and that of North Carolina Runner nearly twofold, whereas yields of Spanish 2B and White Spanish were not appreciably affected. In the large-seeded varieties kernel development was more dependent upon Ca application than in Spanish varieties. There was little difference in varietal response to K. K did not beneficially affect kernel development, but through effects on plant size its addition resulted in increased yields. Oil contents of large and medium kernels were affected comparatively little by fertilization or by variety, although in general kernels from fruits of a high shelling percentage were somewhat higher in oil than those from fruit of lower quality. Yield of oil per acre is essentially a function of pounds of plump kernels produced.

The indigenous American potatoes and their value in plant-breeding, J. G. HAWKES (*Empire Jour. Expt. Agr.*, 13 (1945), No. 49, pp. 11-40, illus. 3).—The most recent advances in the knowledge of the native American species and the uses to which they have been and might be put by plant breeders are reviewed; the systematic classification and geographical distribution of the native American potatoes (E. S. R., 91, p. 678) are discussed; and the fertility of the various species and results obtained in interspecific crosses are outlined briefly. References to literature total 55.

Growing fall potatoes, S. H. WITWER and A. D. HIBBARD (*Missouri Sta. Cir.* 301 (1945), pp. 4).—Planting practices, varieties, seed sources and treatments, and methods of control of diseases and insects are described for the fall potato crop in Missouri home gardens.

Fertilizers for potatoes in the Red River Valley, C. O. ROST, H. W. KRAMER, and T. M. McCALL (*Minnesota Sta. Bul.* 385 (1945), pp. 16, illus. 6).—Experiments to determine effects of commercial fertilizers on the growth, yield, and market grade of potatoes were conducted in 1939 and 1941-43 in cooperation with growers in Clay, Norman, Polk, and Marshall Counties on Fargo clay and silty clay and Bearden silt loam (heavy soils) and on Bearden loam, Grinstad fine sandy loam, and Ulen loamy sand (light soils). Treatments included superphosphate (P) alone, phosphate and potash (K), and potash alone. In 1939, N fertilizer was included. On heavy-textured soils, approximately 13 percent of the fields did not respond to fertilizers, 40 percent gave greatest increases in yield with P alone, and 47 percent with a PK mixture. On light-textured soils 16 percent failed to respond to fertilizer, another 16 percent gave maximum increases with P alone, and 68 percent with a PK mixture, indicating the importance of K in the mixture for the light-textured soils. Market grade was not affected significantly by fertilizer but the number of marketable tubers was increased. Fertilizer tended to improve cooking quality. All treatments produced an increase in top growth. When combined with P the forms of K tested, KCl,  $K_2SO_4$ , and manure salts, were equally effective. Neither K alone nor B, Zn, Mn, Cu, or Fe increased yields significantly. There was a definite residual effect of the fertilizer on yields of spring grains following potatoes. Fertilizer mixtures for potatoes on the two soil groups are suggested.

Effect of fertilizers on the quality of potatoes grown in the Red River Valley of Minnesota, L. E. DUNN and C. O. ROST. (*Minn. Expt. Sta.*). (*Amer. Potato Jour.*, 22 (1945), No. 6, pp. 173-187).—Quality ratings and percentages of dry matter were obtained for potatoes grown at 30 different locations in the above experiments in 1942 and 1943 for the purpose of determining the influence of P and K fertilizers on cooking quality. The fertilizers were associated with slight but not significant increases in the cooking quality of tubers grown on the heavy soils, and caused significant improvements in cooking quality and particularly in baking quality for the light soils, which, in general, are the more deficient in the nutrient elements. K fertilizers caused a significant reduction in surface sloughing of the potatoes when boiled in distilled water. The improvement in quality of potatoes grown on the light soils was due partly to the fertilizers supplying nutrients needed by the plant and partly to the increasing of the salt content of the potatoes by the fertilizers. P fertilizers tended to increase the dry matter content of the potatoes, whereas K lowered it significantly.

Defoliating soybeans to facilitate harvesting, E. E. BARNEs. (*Ohio Expt. Sta.*). (*Soybean Digest*, 5 (1945), No. 9, pp. 8-10, illus. 2).—Soybeans could be defoliated completely in a week, with the aim of making earlier combining possible, by dusting in September with 75 to 100 lb. of cyanamide dust per acre in field experiments, 1942-44. The leaves were killed but continued to cling to the plants when these quantities were doubled. Defoliation did not impair germination,

although it tended to reduce the ash content of the seed and at immature stages to lower the oil content slightly. Cyanamide dust killed most weeds common in soybean fields, smartweed being least affected. There were indications of favorable residual effects of the dust on other crops.

**Soybean seed production in Missouri.** B. M. KING (*Missouri Sta. Cir.* 300 (1945), pp. 11, illus. 1).—Suitable soils for the soybean seed crop in Missouri, appropriate fertility treatments, better adapted varieties, productive cultural practices, and proper harvesting methods are described with the aim of increasing acre yields and the efficiency of production.

**Results of sugarcane variety tests in Louisiana during 1944.** G. ARCEAUX and L. P. HEBERT. (U. S. D. A.). (*Sugar Bul.*, 23 (1945), No. 18, pp. 143-149).—Results obtained in cooperative plantation tests with commercial varieties of sugarcane and promising new seedlings on light, heavy, and muck soils are reported, with special comments on C.P. 34/120, 36/105, 36/19, 34/139, 28/19, 33/425, 35/14, and 36/62.

**Sugar cane test fields—season of 1944.** C. B. GOUAUX. (La. Expt. Sta.). (*Sugar Bul.*, 23 (1945), No. 18, pp. 150-155).—C.P. 36/105, 36/183, and 34/92 were outstanding in comparisons on eight test fields. Favorable comments are also made on C.P. 34/139, 33/224, 36/105, 34/120, 29/320, 29/120, and 33/310.

**Sugar research at the Audubon Sugar Factory during the 1944 season.** C. W. STEWART. (La. State Univ.). (*Sugar Bul.*, 23 (1945), No. 18, pp. 155-158; *abs. in Sugar*, 40 (1945), No. 7, pp. 45-46).—Effects of trash on the grinding rate of sugarcane and on the purity drop between crusher and mixed juice were determined in four tests on different days during the 1944 season at the Audubon experimental sugar factory. The grinding rate was reduced about 16 percent when the trash was 11 to 12 percent by weight. The purity drop between crusher and mixed juice was 1.72 percent when grinding clean sugarcane and 4.40 percent with trashy cane. In a test to show effects of green tops on the sucrose content of cane, the stalks were cut at the bud, or spread of the leaves, and cleaned. When 12 in. were cut from the top of all 60 stalks tested, the juice was found to contain about 0.37 percent sucrose. A second 12 in. showed 2.37 percent sucrose, and the remainder of the cane analyzed 12.81 percent sucrose. The whole cane averaged 11.18 percent sucrose, and with the first 12 in. removed 11.61 percent sucrose. On a basis of standard cane the entire stalk equals 94 percent standard cane, whereas the stalk, less 1 ft. equals 100 percent standard cane. A milling test was also made using the J. J. Munson cross groove on the top roll of the third mill.

**Proceedings of the 1943 meeting of sugar technologists (Port-of-Spain, Trinidad: Brit. West Indies Sugar Assoc., 1944, pp. 115+, illus. 10).**—Technical papers (with discussion) presented at the meetings in the Imperial College of Tropical Agriculture, November 18-20, 1943, included Science in Sugar Production, by F. Hardy (pp. 8-13); Discussion on Research Work 1942-43 of the Department of Sugar Technology, I. C. T. A., by O. T. Faulkner (pp. 14-20); Natural Humus and Artificial Fertilisers, by R. R. Follett-Smith (pp. 21-26); Pest Problems of Sugar Cane Cultivation in Trinidad, by A. Pickles (pp. 27-33); Progress in Tillage Methods on Sugar Estates in Trinidad—The Results of Some Tillage Experiments, by P. E. Turner (pp. 34-50); The Graining of "A" Molasses in Martinique, by H. L. Grogan (pp. 51-53); The Measurement of Final Molasses, by G. T. Warren (pp. 54-60); Lubrication in the Cane Sugar Factory, by R. A. Jordan (pp. 61-67); Sugar Deterioration, by L. S. Birkett (pp. 68-76); Deterioration of Sugar During Storage, by H. L. Grogan (pp. 77-83); An Index of Relative Fertility of Cane Fields, by M. D. Fulton, L. S. Birkett, and R. R. Follett-Smith (pp. 84-85); The Application of the Chloride Method of Control to a Specific Factory Problem, by H. B. Springer (pp. 86-90); Growth Measurements on Sugar

Cane for the Rapid Determination of Fertiliser Requirements, by C. C. Seale (pp. 91-95); and The Methods of Agriculture in Standard Use on Sugar Estates in Various B. W. I. Colonies and Dependencies (pp. 97-115).

Regional studies of time of planting and hill spacing of sweetpotatoes, W. S. ANDERSON, H. L. COCHRAN, J. B. EDMOND, O. B. GARRISON, R. E. WRIGHT, and V. R. BOSWELL. (Coop. Miss., Ga., S. C., and Tex. Expt. Stas.). (*U. S. Dept. Agr. Cir.* 725 (1945), pp. 20, illus. 1).—The influence of time of planting and of hill spacing upon the yield, grade, root shape, starch content, and carotene content of sweetpotatoes was studied at Blackville, S. C., Experiment, Ga., Laurel, Miss., and Gilmer, Tex., 1940-42. Delay in time of planting reduced significantly the production of the important grades, regardless of place, variety, year, or spacing in rows. Time of planting was the most potent single factor studied. Delays in planting became more serious in reducing total yield when occurring late in the season. The first delay caused a yield reduction of 38 bu., the second a further loss of 48, the third 46 more, and the fourth 56 bu. more. Effects of planting time upon yield of No. 1's varied from place to place, but, as a whole, delays tended to cause decreases. The earlier delays caused the greater reductions in yield of No. 1's. Time of planting had a far greater influence upon yields than did hill spacing, which above 8 in. had little effect upon total yield unless it was as wide as 24 in. Yields in the late plantings were generally so poor that differences due to spacing were small. Close spacing resulted in a slightly larger proportion of No. 1's in late plantings than did wide spacing, yet late planting still resulted in heavy reductions in yield.

Starch content in Triumph sweetpotatoes from late plantings was lower than from early and midseason plantings. Hill spacing did not materially affect starch content. Roots of the Porto Rico variety grown from late planting contained less carotene than those produced by early and midseason planting. While considerable variation was noted in data on effects of hill spacing upon carotene content, in general roots from the wider spacings were lighter in color. Significant changes occurred in root shape from chunky to slender as planting was delayed, with Porto Rico being affected more than Triumph. Hill spacing had very little effect upon the shape of roots.

Studies on the optimum nutrition of flue-cured tobacco, E. T. McEvoy (*Sci. Agr.*, 25 (1945), No. 8, pp. 489-498).—Effects of the six major nutrient ions on the growth of flue-cured tobacco in artificial culture were studied at Ottawa, Ont., and an optimum nutrient solution was developed for White Mammoth. No exact ionic ratio in the nutrient medium was found to be required for maximum growth, although the optimum concentration range of each nutrient ion was determined. The highest correlation between the nutrient supply and the growth of the plant was observed for NO<sub>3</sub> between the limits of one and nine, and it was followed in order of influence of the anions on growth by PO<sub>4</sub> and SO<sub>4</sub>. At increasingly high concentrations of NO<sub>3</sub> in the nutrient solution, the effectiveness of this ion in producing high yield was conditioned in increasing degree by the relative proportions of Ca, Mg, and K in the solution. At high NO<sub>3</sub> levels, greatest growth was produced when Ca and K were each supplied at a concentration of 5 to 8 parts of a total of 15 relative parts of the cation concentration, their combined concentration being 13 parts. The remaining 2 parts were supplied as Mg. Increase in the nutrient supply of each of NO<sub>3</sub> and K was associated with an increase in the percentage of water in the leaf tissue and increase in the Ca supply with an increase in the percentage of dry material. No relationship was observed between the supply of PO<sub>4</sub>, SO<sub>4</sub>, and Mg and relative proportions of water and dry matter in the tissue.

**Bright leaf tobacco curing, E. G. Moss and N. C. TETER.** (Coop. U. S. D. A.). (*North Carolina Sta. Bul. 346 (1944)*, pp. 25, illus. 10)—The procedure of curing bright-leaf tobacco is outlined, different types of barns and their construction are described, difficulties encountered in curing are mentioned, and methods of avoiding damage in the cure are suggested. The plan for improving tobacco curing consists of installation of stokers for firing the barn, placing a heating jacket about the fire joint, use of a hygrometer as a guide to regulating the ventilation, and better insulation of the barn. Data on fuel costs with different fuels and types of barns are included.

**Kernel characteristics of Kansas winter wheat varieties, L. P. REITZ** (*Kansas Sta. Rpt. 2 (1945)*, pp. 24, illus. 23)—The important morphological characteristics of kernels from the wheat varieties Tenmarq, Pawnee, Comanche, Turkey, Black-hull, Early Blackhull, Chiefkan, Kawvale, and Clarkan are depicted by plates and figures. Use of these illustrations along with practice on pure samples of these varieties may enable an apt operator to attain reasonable proficiency in placing a variety grown in Kansas in one of six varietal groups based on kernel characteristics. When the market grade designation does not describe commercial wheat adequately, varietal identification by the methods described may aid in sorting out lots of wheat made up of the varieties desired, thereby making it easier to secure mill stocks for specific uses. The method is not regarded as satisfactory for shriveled, weathered, scoured, or otherwise damaged grain, and it cannot be recommended as a basis for choosing pure seed wheat for planting. Its main use appears to be as an adjunct to the present official commercial grading of domestic wheat.

**Controlling broad-leaved annual and biennial weeds with Sinox, S. C. LITZEN-BERGER, A. H. POST, and G. H. BINGHAM** (*Montana Sta. Bul. 430 (1945)*, pp. 17, illus. 7)—Sinox (sodium dinitro-ortho-cresylate) (E. S. R., 83, p. 55), a non-corrosive, selective herbicide used for controlling certain broad-leaved annual and biennial weeds, has been applied as a dilute solution with power sprayers without permanent injury to wheat, barley, oats, flax, peas, and most grasses under soil and weather conditions at Bozeman, 1942-44. For most broad-leaved annual and biennial weeds the dosage is 1 gal. of Sinox with 2 lb. of either ammonium sulphate, sodium bisulphate, or monobasic ammonium phosphate in 100 gal. of water applied at the rate of 80 to 100 gal. per acre. The lower rates are applied to the more susceptible crops, as peas and flax, which should not be sprayed until they are about 3 in. high and never sprayed after bud formation. Small grains can be sprayed when they are taller, but should be treated before the jointing stage or before they tend to cover the weeds. Weed plants are killed most easily when they have developed three to seven leaves. The cost of treating 1 acre of flax, peas, barley, oats, or wheat with Sinox spray is estimated at about \$3.50 to \$4.50.

The Sinox spray materials have had no injurious effects on the soil at the recommended dosages, and yield increases of up to 264 percent have been obtained after their use with light to heavy weed infestations. Elimination of the weeds made harvesting easier, less labor was needed, and grain had less dockage. Although specially equipped commercial types of spray machines are available, satisfactory results may be obtained by altering power sprayers used to spray orchards, potatoes, and perennial weeds. Attachment of the proper boom to the sprayer, for which plans are included, is the only major change necessary.

**Nassella tussock (Nassella trichotoma (Nees.) Hack.) field studies and their agricultural significance, A. J. HEALY** (*New Zeal. Dept. Sci. and Indus. Res., Bul. 91 (1945)*, pp. 90+, illus. 27).—A comprehensive report on investigations, 1941-43, providing information on the origin and distribution of this aggressive grass (a native of South America), its botany including habitat factors, life forms, seed production and dissemination, germination, and establishment within different

plant associations; farm management practices in relation to its control; and control and eradication by cultivation, grazing, burning, herbicides, and other methods.

Eradication of white horsetail in southern Arizona, C. H. DAVIS, T. J. SMITH, and R. S. HAWKINS (*Arizona Sta. Bul. 195* (1945), pp. 14+, illus. 1).—White horsetail (*Solanum elaeagnifolium*), a noxious weed of irrigated fields in southern Arizona, is a drought-enduring, wide-spreading plant difficult to control in the open. Its roots were found to extend deeper than 10 ft. in Gila fine sandy loam and in Pima silt loam. Control experiments at Tucson and Phoenix, 1937-43, involving cultivation, cropping, and chemicals showed that white horsetail may be eradicated in 3 yr. by anyone of the three systems of cropping outlined. These include the growing of winter grain during the winter dormant period with clean cultivation during the summer growth period of the weed, or growing cotton plus hoeing each month or when weeds appear, or clean cultivation in early summer followed by sorghum in late summer. Shade from sorghum or cotton apparently is a main factor in eradicating white horsetail but was not effective without adequate cultivation and hoeing. Hoeing alone or burning with a weed burner during the growing season in 2 yr. did not give satisfactory control. Sodium chloride, dry or spray, and alfalfa cut for hay were not effective in control. Complete eradication of small patches was obtained with two annual treatments of CS<sub>2</sub> applied as 2 oz. injections into the soil 18 in. apart or at the base of each plant.

## HORTICULTURE

Victory gardening in the United States, M. R. NEWMAN and N. W. SMALLWOOD (*U. S. Dept. Agr., Library List 15* (1945), pp. 32).—This list contains selected references to books and pamphlets and to publications of State and Federal agencies.

Late plantings of vegetables, A. D. HIBBARD and S. H. WITTWER (*Missouri Sta. Cir. 302* (1945), pp. 11, illus. 3).—General information is presented on date of killing frosts, conservation of moisture, desirable species and varieties for late planting, use of fertilizers and manure, methods of seeding, tillage operations, irrigation, and control of insects and diseases.

Mid-season application of fertilizers, C. B. SAYRE. (N. Y. Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 3, pp. 2, 3).—Side dressings of fertilizer are conceded particularly valuable to vegetable crops in a year such as 1945 when there was an unusually heavy snow cover and little soil freezing followed by a wet cold spring, which retarded nitrate formation and delayed plowing under of winter cover crops.

Sandy soils are most likely to respond profitably to side dressings of N and often of K. The various N materials, methods of application, crop indications of fertilizer needs, etc. are discussed.

Oil sprays for the control of weeds in carrots and other vegetables (preliminary report), R. D. SWEET, R. KUNKEL, and G. J. RALEIGH. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 440-444).—A number of different petroleum products, stove oil, fuel oil No. 2, and kerosene, were tested on various garden crops for the control of weeds. Vegetables that tolerated oils were carrot, celeriac, turnip-rooted parsley, and celery, all members of the Umbelliferae family. Weeds that were able to endure oil were ragweed, poison-ivy, wild carrot, certain grasses, and galensoga. Weeds that were susceptible to oil were dandelion, lambquarters, purslane, redroot, sorrel, and various grasses.

In a group of trials with carrots, kerosene was least and fuel oil No. 2 most toxic. However, there were great differences in different lots of oils and no way was established of predicting these differences in advance. The toxic effect of oils was increased if applied to plants when the leaves were wet. Carrot seedlings

should have at least two true leaves before oil sprays can be safely applied. Plants having three or more true leaves were rarely seriously injured. If carrot roots were used within a short period after oil treatment, there was a slight odor of the oil.

The use of oil sprays as selective herbicides for carrots and parsnips, W. H. LACHMAN. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 445-448, *illus.* 2).—Two commercial oils known as Sovasol No. 5 and Sovasol No. 75 were tested on carrot and parsnip plantings as weed destroyers. When mixed with two parts of white kerosene both materials proved valuable as selective herbicides and caused no apparent damage to either carrots or parsnips. Carrots sprayed three times with Sovasol No. 5 gave no hint of an oily flavor when eaten raw or cooked. There was a material saving in operational costs as compared with hand weeding. Vegetables other than those of the Umbelliferae family were injured in varying degrees of severity, some being completely destroyed by the oil sprays. The sprays did not give fully satisfactory results after the weeds had become more than 5 or 6 in. tall.

Snap bean breeding and variety trials (*South Carolina Sta. Rpt.* 1944, pp. 125-127).—Asgrow Black Valentine and Tendergreen, the chief commercial varieties in the Charleston, S. C., area, often fail to set satisfactorily in late spring and early autumn. A wax-podded bean, found in a field of Asgrow Black Valentine in 1940 and now being released under the name of Cherokee Wax, has proved more productive than Valentine and Sure Crop Wax and capable of setting pods during hot weather. Logan, a product of the U. S. D. A. Regional Vegetable Breeding Laboratory, was 52 percent more productive than Tendergreen and is resistant to mosaic and mildew. The comparative yields of several varieties and promising seedlings are presented in tabular form.

Effect of lime, potash, and magnesium on yields of snap beans (*South Carolina Sta. Rpt.* 1944, pp. 124-125).—Lime was highly beneficial to snap beans grown on a well-drained Nosbig fine sandy loam. The average yield of all limed plots was 102 percent greater than that of unlimed plots receiving the same amount of fertilizer. The beans did not respond to potash or magnesium, but it is thought possible that the needs of these two elements were met by the residual material left over by a preceding potato crop.

A study on the storage of carrots under home conditions, R. E. NYLUND. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 405-412).—Chantenay carrots sown on June 24 and harvested on October 12, 1943, were, after careful sorting to remove injured and decayed roots, stored in various types of containers with crowns intact and with crowns removed. Three storages were used averaging 36°, 43°, and 53° F. The relative humidity was maintained at 82 to 85 percent in all three storages.

Carrots lost 27, 48, and 98 percent of their weight by decay and shriveling after 137 days of storage at the above temperatures, respectively. Lining of the container to provide a high relative humidity decreased weight losses. However, the use of airtight containers resulted in excessive decay. The cutting away of the crowns increased decay loss in the early storage period as compared with the uncut carrots. Later in the storage period, the situation was reversed so that at the end of the 137 days the percentages of usable carrots was approximately the same in the cut and uncut carrots. Storage in damp sand or soil was beneficial at all three temperatures, with one proviso that at the highest temperature no method proved satisfactory without crown removal.

Further studies on effect of temperature on initiation of flowering in celery, H. C. THOMPSON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 425-430).—In this contribution (E. S. R., 62, p. 42), which presents the results of three experiments conducted in 1943 and 1944 with Cornell 6 celery, the author

shows that growing plants for as short a period as 2 days at 40°-50° F. had an appreciable effect on seedstalk development when the celery was grown subsequently at temperatures too high for floral induction. Four days at 40°-50° resulted in 75 percent of the plants going to seed subsequently at 60°-70° under the normal day length from December 13 to April 18.

Growing the plants alternately at 40°-50° and 60°-70° had essentially the same effect on subsequent seeding as growing them for half as long a period at 40°-50°. This was true regardless of whether the plants were held at low temperature during the dark or light period.

When plants were grown in a warm greenhouse at 70°-80° after the low-temperature treatment, no seedstalks were formed regardless of the length of the cold treatment up to 32 days. High temperature appeared to prevent floral initiation, although induction must have taken place.

*Cucumber variety test (South Carolina Sta. Rpt. 1944, pp. 137-140).*—Seven varieties were grown in 1944 in a replicated and randomized test, with the result that the A and C and the Colorado varieties are recommended for commercial planting. The most productive variety, Cubit, was off in color and also very susceptible to bacterial spot, *Bacterium lachrymans*.

*Germination of lettuce seed at high temperature (25 to 35 degree C.) stimulated by thiourea, R. C. THOMPSON and N. L. HORN. (U. S. D. A.). (Amer. Soc. Hort. Sci. Proc., 45 (1944), pp. 431-439).*—An earlier paper (E. S. R., 81, p. 790) by Thompson and Kosar reported that certain sulfur-nitrogen compounds, including thiourea, have a stimulating effect on the germination of dormant lettuce seed.

To give the new treatment a wider test, numerous genetically different lots of lettuce seed were treated with 0.5-percent solution of thiourea under several conditions of temperature, time duration, and light. In every instance thiourea treatment resulted in a much higher percentage of germination at temperatures above 30° than did the untreated seed.

Soaking seed in water under the same conditions as for the thiourea resulted in most cases in a very marked stimulating effect on germination at temperatures above 30°. However, the thiourea treatments gave always a higher percentage of germination than the corresponding water treatments.

The most effective combination of treatments, whether thiourea solution or water, was found to be a treating period of 8 to 10 hr. at 18° in darkness followed by a rapid drying of the seeds upon removal from the liquid.

A lengthening of the treating period to 12 hr. resulted in injury in some embryos, especially at the higher temperature used (27°).

Treating the seed in darkness was found more effective than treating in diffused sunlight.

*The culture of set onions in the Connecticut Valley, W. G. COLBY, C. J. GILGUT, and H. M. YEGIAN (Massachusetts Sta. Bul. 424 (1945), pp. 16, illus. 11).*—The marketable onion crop of the Connecticut Valley is now produced largely from sets rather than seed. The crop is grown on fine sandy loam which may blow badly during the off-season period. Of various cover crops tested for holding the soil and increasing the organic matter, domestic ryegrass was most successful. Even when plowed under in late fall, the plant residues tended to hold the soil. Large amounts of fertilizer are used in the valley and as a result some injury to young bulbs may occur during a drouth period when the soil solution becomes concentrated.

The Ebenezer onion is the principal variety grown, with an increasing percentage of Globe onions coming into the picture. Hand planting of sets is more effective than machine planting, but machines are more economical despite the reduction in yield. Maximum yields are obtained as a rule if sets 0.5 to 0.75 in. in size are spaced 2.25 to 2.5 in. in rows 13 to 14 in. apart.

Weeding is a difficult task. Tractor cultivation is possible during the early season but may cause root injury later on. Quality of seed sets is important, and sets produced locally have generally proved superior to imported stock.

Soil-borne diseases cause serious injury at times, particularly during periods of excessive moisture.

Harvesting should be promptly done and the onion got under cover. Stacking onions in slatted crates facilitates drying. Stored onions must be kept dry, and the lower the temperature without actual freezing the better.

The effect of copper sprays, fertilizers, and shade on the growth of pepper seedlings, B. L. RICHARDS, JR., and R. D. SWEET. (*Cornell Univ. Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 449-450).—Certain copper sprays proved toxic to pepper seedlings and this tendency was increased if the young plants had been fertilized with nitrogenous materials. In fact where nitrate of soda was applied at the rate of 50-75 lb. of actual N per acre, there was noted considerable injury to pepper seedlings even if no copper sprays were applied. The authors suggest that such injury may be due to an excessive osmotic concentration in the soil solution. Light intensity and photoperiod length may be also involved, but the evidence was not conclusive. Nitrate of soda reduced the growth of pepper seedlings when applied to a soil of low fertility at the rate of 300 lb. per acre.

Production of tablestock rutabagas in Michigan, B. R. CHURCHILL (*Michigan Sta. Bul.* 197 (1945), pp. 19, illus. 12).—Information is presented on soil and climatic requirements, varieties, preparation of the seedbed, planting, sowing the seed, thinning the stand, cultivation, control of insect and disease pests, harvesting and storing, marketing, waxing rutabagas, etc.

Heavy fertilizing brings bigger tomato yields, J. HARTMAN. (*Purdue Univ. Food Packer*, 26 (1945), No. 6, p. 62).—On a poor, light colored silt loam soil located south of Indianapolis, Ind., an application of 1,000 lb. per acre of a 2-16-8 fertilizer on the plow sole plus 200 lb. of the same in the row increased tomato yields from 5.69 tons on the control plots (400 lb. of 2-16-8 in the row) to 9.45 tons on the treated plots. An application of 10 tons of manure on the soil surface before plowing increased yields somewhat but not enough to justify the cost.

A new material for blossom thinning, to serve as a sticker and to reduce transpiration, V. R. GARDNER. (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 42-44).—In the fall of 1938 studies were begun on the development of a material that could be applied as a spray during the active growing season and would be nontoxic to the foliage and at the same time lower transpiration so as to assist the trees during drought periods. Among materials developed were combinations of vegetable oils, paraffin wax, bentonite, and an emulsifying agent. One such material was applied to Duchess apple trees when in full bloom. There was no evidence of injury to any of the vegetative tissues. On the check trees 58 percent of the bearing spurs carried one fruit only, 34 percent bore two fruits, and 8 percent three or four fruits. On trees sprayed with 1 percent oil-wax emulsion about 75 percent of the bearing spurs carried one fruit, 22 percent two fruits, and 6 percent three fruits. A 5 percent emulsion gave practically the same results as the 1 percent.

Another type of oil-wax emulsion was applied to Montmorency cherry trees in an effort to check transpiration and help the trees through a hot dry period. One, two, and three applications resulted in 7, 15, and 30 percent increases in the average size of the cherries, respectively. Whether the wax emulsions counteracted the harmful effects of copper fungicides or were directly beneficial was not established.

In addition, the wax emulsions proved to be very effective as spreaders and stickers for the ordinary insecticides and fungicides applied to deciduous fruit trees.

**Effects of thinning York Imperial apples with Elgetol sprays applied at blossom time.** W. S. FLORY, JR., and R. C. MOORE. (Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 45-52).—Experiments with York Imperial apple trees planted in 1911 showed that Elgetol sprays in concentrations of 0.3, 0.25, and 0.2 percent resulted in satisfactory flower thinning. Data from selected branches suggested that the 0.15 percent material gave good results, but total tree yields did not substantiate this conclusion. Fruit size and weight were significantly increased by all these sprays, but a decrease in No. 1 apples due to increased roughness and stipple in the larger apples resulted from the thinning. No perceptible differences in color of fruit were observed as a result of Elgetol treatments. The 0.2 percent spray is, because of economy and lessened chance of foliage burning, considered the most effective of the several concentrations tested.

**Preliminary studies on adapting Virginia Crab to top-working with Stayman.** J. A. MCCLINTOCK. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 177-180).—Several varieties of apples were top-worked on Virginia Crab in such a manner that the roots, trunk, and scaffold limbs were Virginia Crab. Stayman Winesap failed to make satisfactory growth, either failing to unite at all or making poor growth. However, three red fruited sports of Stayman Winesap, namely, Blaxstayman, Staymared, and Scarlet Staymared grew satisfactorily. Compared with Grimes Golden, whose scions made an average of 31 in. of new growth the first year on Virginia Crab, the three Stayman sports averaged 28, 30, and 30.6 in. Turley, supposedly of the Winesap family, averaged 44 in. The desirability of permitting the Virginia Crab understock to produce some leaves as a means of facilitating union with difficult scion varieties is discussed. The author raises the question as to whether or not color sports may not mutate in other ways than color alone, thus making successful unions possible even when the parent variety is incompatible.

**Differences in congeniality of two sources of McIntosh apple budwood propagated on rootstock USDA 227.** H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 190-194, illus. 1).—Studies with the USDA 227 rootstock, a very vigorous clonal selection obtained from an open-pollinated seedling of Northern Spy and capable of being propagated by root cuttings, showed it to be compatible with McIntosh scions taken from one tree, McIntosh 7-1, and incompatible with scions from another McIntosh tree known as 1-35. In both cases, the buds united with the rootstock and grew vigorously for several weeks. However, when the young trees of McIntosh 1-35 reached 40-50 cm. in height, growth was arrested and the foliage became necrotic. At the end of the season, the 7-1 trees averaged  $139.7 \pm 3.5$  and the 1-35 trees  $55.9 \pm 4.7$  cm. The possible causes of these marked differences in congeniality are discussed. It is suggested that the McIntosh scions may have been different genetically or that some virus or unknown factor may be present in the uncongenial 1-35 strain.

**Some factors affecting apple yields in the Okanagan Valley.**—I, Tree size, tree vigour, biennial bearing, and distance of planting, J. C. WILCOX (*Sci. Agr.*, 25 (1944), No. 4, pp. 189-213, illus. 4).—The McIntosh apple, the most widely planted variety in the Okanagan Valley of British Columbia, averaged 456 boxes per acre during the 4-yr. period 1937-40. Intensive records were maintained on a large number of trees distributed throughout the valley. Biennial bearing was found to have a marked effect on tree growth, with the year of high production the year of small increment in trunk girth, long terminal length, and small terminal diameter. In general (1) the larger the tree, the greater the total and the profitable yields per acre; (2) the longer the terminals, the greater the total yields, but not the

profitable yields; and (3) the greater the degree of biennial bearing, the less were the total and profitable yields. Trees occupying less than 900 sq. ft. per tree produced higher yields per acre, both total and profitable, than did trees occupying more space.

Leaf color standards may lead to better McIntosh apples, D. BOYNTON. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas]*, 11 (1945), No. 3, pp. 1, 2, illus. 1).—Weather and nitrogen level of the trees at harvesttime are conceded the two most potent factors influencing the color and quality of McIntosh apples. Despite the fact that nitrogen increases yield it is considered advisable to regulate the supply, so that an abundance of nitrogen is available to the trees during the period of fruit set and vegetative growth and at the same time the supply is reduced in late summer when the fruit is approaching maturity. This may be accomplished by late fall or early spring applications of quickly available nitrogen. Considerable evidence was obtained that the nitrogen content of leaves picked from the middle portion of shoots from mid-July to late August reflects the nitrogen level of the tree and is related to the yield and quality of the fruit that would be harvested in September.

Under normal conditions a tree whose leaves contained less than 1.8 percent N in their dry weight yielded less than it should, but the fruit was high in color and quality. A tree whose leaves contained more than 2.1 percent N yielded maximum crops, but the fruit was low in color and quality unless the weather in the ripening period was favorable to color development. An N content of 1.9 to 2.0 percent was close to maximum in production of fruit of reasonably good quality and color. Leaf color was observed to be correlated with nitrogen status, and a set of seven leaf-color standards was constructed which it is hoped will aid McIntosh growers in knowing when to fertilize their trees.

The effects of differential nitrogen treatments in the orchard on the keeping quality of McIntosh apples, R. M. SMOCK and D. BOYNTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 77-86, illus. 2).—Studies in five New York orchards gave a strong suggestion that fruit firmness is decreased by nitrogen applications to the soil. There were exceptions in which N did not result in decreased firmness, and these were usually correlated by an absence of effect on leaf N. Differences in firmness were more evident in fruits after storage than at harvesttime and usually persisted through storage. A preliminary study of the effect of N level on respiration rate of fruits held at high temperature indicated a more rapid rate in fruit from the higher N levels. An inverse correlation was noted between leaf N and firmness, but that between size of fruit and firmness was not so strong.

There was a better correlation between leaf N and ground color development than between actual N additions and ground color. A high leaf N content was usually associated with greener ground color. In the cases where significant differences were observed between N additions and soluble solids content of the fruit, the larger the N additions the lower were the soluble solids. There was some suggestion that the larger N applications may have increased brown core development in storage. In the fruit from four of the five orchards there was no effect of N applications on storage scald. In fruit of the fifth orchard there was a strong suggestion of reduced scald with the higher N applications.

Hormone sprays and their effect upon the keeping quality of Bartlett pears, F. W. ALLEN and A. E. DAVEY (*California Sta. Bul.* 692 (1945), pp. 45).—The use of hormone sprays to prevent premature dropping of fruit has become a standard practice of California pear growers. There was some question as to whether the treated fruit kept as well in storage as subsequently as did the normal crop, nor was it clear whether this effect was simply the result of the pears hanging longer on the tree or that some physiological influence was also in the picture.

Watery break-down of Bartlett pears occurred in fruits harvested from both sprayed and unsprayed trees. It is suggested that when sound pears begin to drop from unsprayed trees, the fruit is picking ripe and that hormone sprays should not be used to extend the normal picking season. Break-down of pears from the Sacramento River and Santa Clara Valley was more severe in fruits from sprayed than from unsprayed trees. Fruit from the former was more mature, partly because of the harvesting of certain pears which had dropped from the unsprayed trees, but also, apparently, because the relatively early sprayings hastened the ripening of the later pickings. Little break-down would have occurred had harvest been completed in some orchards 10 days to 2 weeks earlier and the fruits placed under adequate refrigeration with less delay.

More rapid ripening and greater loss from break-down in sprayed pears was noted in numerous lots ripened at the cannery; but no differences in processing the sprayed and unsprayed fruit were evident when samples were cut January 12, 1945.

Preliminary investigations of the cold resistance of peach fruit buds at the pink bud stages of development, M. A. BLAKE and C. H. STEELMAN, JR. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 37-41).—In the spring of 1942 buds of Cumberland and Greensboro in the early pink bud stage and Dwarf Blood, Mexican Honey (P. I. 32373), and Elberta at the medium pink bud stage were collected on April 16 when the maximum day temperature was 46° F. These were placed in the controlled freezing chamber at 62° and the temperature lowered gradually during a 16-hr. period to 20°. At this time some buds were withdrawn and the others allowed to remain for 2 and 9 hr. longer, when the temperatures had declined to 15° and 9°, respectively.

The percentage of injured buds of Cumberland, Dwarf Blood, Greensboro, and Mexican Honey at 20° did not exceed 22 percent in any variety. The buds of Dwarf Blood did not suffer much more injury at 15° than at 20°, and the injury to Cumberland and Mexican Honey was not sufficient to reduce the potential crop of fruit. At 9° the injury to the Elberta buds was severe, and the Mexican Honey buds suffered less, yet considerable, injury. Greensboro and Cumberland buds were moderately resistant to 9° and Dwarf Blood outstandingly so. A comparable test of Raritan Rose buds showed 23 percent alive at 10°.

On April 20, when buds of most varieties had developed beyond the so-called dormant stage, the buds of the very late blooming Early Heath, which showed no pink, were more sensitive to low temperature 10° than were buds of Hiley and Summercrest in the advanced pink stage.

Although no attempt was made to classify the 16 varieties used in the test as to relative hardiness, it was clearly evident that Early Heath buds were more sensitive to injury than were those of most of the other 15 kinds. The practical significance of such trials to peach breeders and growers is emphasized.

Starch and sugars of *Vitis vinifera*, A. J. WINKLER and W. O. WILLIAMS. (Univ. Calif.). (*Plant Physiol.*, 20 (1945), No. 3, pp. 412-432, illus. 6).—Analyses of samples of Carignane grape shoots, collected at different times throughout the year, showed that the winter disappearance of starch is almost quantitatively accounted for by the appearance of an equivalent amount of sugar in the above-ground sections. No evidence was seen of dormant-season carbohydrate translocation nor of the hydrolysis of hemicellulosic or materials other than starch or sugars. Aside from the winter conversion of starch to sugar, the sugar content of mature tissues did not fluctuate markedly. There was no evidence of winter conversion of starch to sugar in the roots. Extremely high starch storage was observed in the bark sections of the roots and in the rootlets, and even at the summer minimum relatively large amounts of stored carbohydrates were maintained in all the mature

wood tissues. There was an indication in the shoot wood of a gradient of fall starch storage toward the apex and toward the base from a midpoint supply center. The starch and sucrose in the succulent green tissues were of relatively minor importance as compared with the reducing-sugar content. An earlier paper on the hemicellulose content of the Carignane grape vine has been noted (E. S. R., 80, p. 52).

**Commercial grape growing in Missouri.** T. J. TALBERT (*Missouri Sta. Bul.* 484 (1944), pp. 28, illus. 12).—General information is presented as to varieties, propagation, soil requirements, use of contour planting, soil preparation, planting, trellising, pruning, soil management, control of diseases and insects, etc.

**Wood type and original position on shoot with reference to rooting in hard-wood cuttings of blueberry.** F. L. O'ROURKE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 195-197).—Preliminary experiments in 1942 indicated that cuttings taken from blossom-bearing shoots did not root as well as those from vegetative shoots. In a larger trial in 1943, in which 100 1-year-old flower-bearing and vegetative shoots were obtained from Pioneer, Cabot, and June plants in a commercial plantation in New Jersey and the cuttings set in early April in an ordinary cold frame containing a mixture of one-third peat moss and two-thirds sand, the vegetative wood rooted significantly better than the flowering in all positions, except the basal cuttings.

Measurements of new shoot growth indicated that groups of cuttings exhibiting the higher survival also made the greater average growth.

**Bay rum from Puerto Rico.** N. F. CHILDERS and P. SEGUINOT ROBLES (U. S. *Dept. Agr., Agr. in Americas*, 5 (1945), No. 7, pp. 132-135, illus. 4).—Information is presented on the status of the bay-rum producing industry in Puerto Rico, the characteristics of the bay-rum tree (*Pimenta racemosa*), methods of propagation, soil requirements, methods of harvesting the leaves, processing of the leaves to obtain the essential oils, etc. It is suggested that the tree has an important place in Puerto Rican agriculture, but there is a definite limit to the amount of product that could be profitably disposed of.

**The Royal palm in Cuba.** J. C. CRANE (U. S. *Dept. Agr., Agr. in Americas*, 5 (1945), No. 6, pp. 109-111, 115, illus. 4).—Stating that the Royal palm is a tree of great beauty and a conspicuous feature of the Cuban landscapes, the author discusses its use as an ornamental, the uses of the trunk, the leaves, and the fruits.

**Colombia's plantation rubber program.** H. G. SORENSEN (U. S. *Dept. Agr., Agr. in Americas*, 5 (1945), No. 6, pp. 106-108, 114-115, illus. 4).—Of various planting projects initiated during the war to help meet the vital need for rubber, one established in the Urabá region of Colombia is considered the one of greatest interest. A descriptive account is presented of the general area, of the agreements governing the plantings, establishment of nurseries, and plantations.

**Experiences with blight-resistant chestnuts in New Jersey.** M. A. BLAKE and L. J. EDGERTON (*New Jersey Sta. Bul.* 717 (1945), pp. 20, illus. 13).—The virtual elimination of the American chestnut by blight created an interest in imported species possessing resistance to this devastating disease. The authors point out the distinguishing growth and fruiting characters of several species. The nuts of the better Chinese species are almost as sweet as those of the American chestnut. Among chestnuts growing on the station grounds is the Boone, presumptively a hybrid between the American and Japanese species. This tree has proved blight-resistant, but its chief value is as an ornamental tree and breeding material. Observations on a planting of Chinese and Japanese chestnuts showed them to enjoy a well-limed fertile soil and to be more resistant to blight when grown to a single trunk than when grown as a bush. There was a considerable variation in tree form in the Chinese chestnut trees and in their fruiting habits and the character of the

nuts. Hardiness varied also. Propagation is discussed, and suggestions are made for planting.

**Herbs** (*South Carolina Sta. Rpt. 1944, pp. 42-41*).—The results of varietal and cultural trials with a number of garden herbs, notably coriander, sage, dill, fennel, sesame, and thyme are presented.

**Growing holly**, C. H. CONNORS (*New Jersey Stas. Cir. 493 (1945), pp. 8, several illus.*).—General information is presented on soil and climatic requirements, pollination needs, propagation, planting, soil management, pruning, production of fruits with growth-promoting substances, disease and insect pests, etc.

**Comparative root-inducing activity of phenoxy acids**, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Amer. Soc. Hort. Sci. Proc. 45 (1944), pp. 187-189*).—A total of 63 phenoxy compounds were tested in comparison with naphthaleneacetic acid and indolebutyric acid for root-inducing activity on privet cuttings. On the basis of the average number of normal roots, only 4 of the 63 phenoxy compounds were of high and approximately equal activity to naphthaleneacetic acid. These were 2,4,5-trichlorophenoxypropionic acid; 2,4,5-trichlorophenoxyacetic acid; 2,4-dichlorophenoxypropionic acid; and 2,4-dibromophenoxypropionic acid. In general, compounds with the propionic and butyric acid side chains were much more active than those with the shorter (acetic acid) or longer (malonic, valeric, caproic, lauric) side chains. The outstanding exception is the relatively high activity of 2,4,5-trichlorophenoxyacetic acid. The results suggest that root-inducing activity is more closely associated with cell elongation response than with modification of organs. Optimal concentrations are discussed.

**Promising new methods used in propagation of hyacinths**, J. H. CROSSLEY (*Sci. Agr., 25 (1944), No. 4, pp. 169-174, illus. 3*).—Of three methods of propagation compared, the so-called Saanichton system, in which freshly cut bulbs are placed directly into sphagnum peat moss or a mixture of moss and sand without undergoing a dry callusing period, proved fairly satisfactory. Advantages of this system are a saving in the time required for propagation and ease in maintaining a satisfactory relative humidity. The basal plates cut from the bulbs in the process of scooping, and which have heretofore been discarded, offer the grower another means of increasing their hyacinth stocks.

**Afternoon cut roses have longest life**, J. E. HOWLAND. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 11 (1945), No. 3, p. 4, illus. 1*).—Roses cut in the late afternoon kept longer than those cut in the morning.

## FORESTRY

**Postwar program for Idaho: Timber production on the forest lands** (*Idaho Sta. Cir. 99 (1945), pp. 8*).—Setting forth the present status of Idaho forests and forestry, the circular outlines briefly certain measures that must be followed in the postwar period if the forests are to be maintained in a productive and profitable condition.

**Postwar program for Idaho: The farm woodlands** (*Idaho Sta. Cir. 100 (1945), pp. 8*).—Idaho farmers own 692,000 acres of woodlands, made up of coniferous woodlands, cottonwoods, and wood lots and windbreaks. No adequate plans have been developed in the past for the efficient handling of these woodlands. Certain suggestions are presented for the more enlightened handling of these lands.

**Germination of longleaf pine seed at high and low temperatures**, R. D. McCULLY. (U. S. D. A.). (*Jour. Forestry, 43 (1945), No. 6, pp. 451-452*).—In nature, longleaf pine seed germinates ordinarily in November or December and at relatively low temperatures. In July 1941, one lot of seed was cooled with ice and another allowed to remain at laboratory temperatures. Much more complete germination was obtained in the cooled lot. Failure of either lot to germinate as

well in July as in winter is attributed to deterioration in storage between the winter and summer trials.

**Fall planting of hardwood tree seed**, C. E. HEIT. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 3, pp. 14, 15).—Seeds of many hardwood species exhibit an extremely dormant nature which requires a period of low temperature and moist condition to break. The nurseryman accomplishes this by storing seed in moist sand or peat moss at a low temperature. Nature accomplishes the same objective during the winter months. Suggestions are given as to fall planting of numerous species. Certain species like black cherry, cucumbertree, and mountain-ash benefit by removal of the pulp surrounding the seeds. White ash, black cherry, tuliptree, and various nuts gave higher germination by subjecting them to a warm period of moist stratification prior to the normal cold prechilling process. Certain seeds required mulch protection when planted in the fall, because of their sensitivity to freezing.

**Effects of shade upon coniferous seedlings grown in nutrient solutions**, F. S. BAKER. (Univ. Calif.). (*Jour. Forestry*, 43 (1945), No. 6, pp. 428-435, illus. 1).—Seedlings of several species were germinated in sand and then transferred to 40-l tanks of well-aerated nutrient solution shaded by cheesecloth tents. The dry weight of seedlings at 100 days was plotted against light intensity. Three points were clear: (1) The light intensity which gives zero increment varied little among the several species, (2) the efficiency in full sunlight is extremely variable, and (3) there were differences in the shape of curves.

Western larch, Monterey pine, redwood, and Port Orford cedar had nearly or completely straight-line curves with growth increasing regularly with light intensity up to full unobstructed light in the greenhouse. Four other species, ponderosa pine, Jeffrey pine, incense cedar, and Douglas fir, had curvilinear graphs with a tendency to flatten at high intensities.

The growth of the root systems of all the species under restricted light was limited, the differences being rather small and the correlation with reputed tolerance very poor. As a class, intolerant trees are marked by vigorous height growth in early life. It was evident that tolerance is not a simple condition.

**Increasing the growth of loblolly pine by girdling large hardwoods**, H. BULL. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 6, pp. 449-450).—Following an earlier paper (E. S. R., 82, p. 57) which discussed the increased growth of loblolly pine in the first 5 yr. after release by girdling and cutting large overtopping hardwoods, the author records results in the second 5-yr. period. Twice as many pines had died in the 10-yr. period in the control as in the thinned plots. The average 10-yr. d. b. h. growth of the surviving pines was nearly three times as great in the improved plot as in the control. The check plot had actually a net loss in basal area over the 10 yr. All of the girdled hardwoods died within 38 mo., and none had living sprouts after 5 yr., but even after 10 yr. many of the girdled oaks still stood as tall snags. Of the girdled sweetgum, blackgum, and winged elm, 87 percent were entirely down.

**The effect of planting methods on root development**, T. SCHANTZ-HANSEN. (Minn. Expt. Sta.). (*Jour. Forestry*, 43 (1945), No. 6, pp. 447-448).—In 1937 2-2 stock of white, red, and jack pines and white spruce were planted at the Cloquet Forest, Minn., by five methods: (1) Inverted V, (2) shovel slit, (3) regular planting bar, (4) mattock slit, and (5) careless planting by the slit method. Survival records at the end of the first and second growing seasons showed no significant differences between methods. Among the species white spruce showed the lowest survival. A study of the root systems failed to show any important difference attributable to planting method. Jack pines developed a root system more rapidly than did any other of the species. White spruce was the slowest of the four species. The author points out that ample precipitation fell in both years,

and also that the soil was sandy and that the differences might well have been more marked in a heavy clay.

**How sod affects establishment of hybrid poplar plantations,** E. J. SCHREINER. (U. S. D. A. et al.). (*Jour. Forestry*, 43 (1945), No. 6, pp. 412-427, illus. 11).—Hybrid poplars are capable of exceptionally rapid growth under favorable conditions, but when planted in direct competition with sod their performance is unsatisfactory. Experiments with two hybrid poplar clones conducted near Williamstown, Mass., on land which had been in undisturbed sod for some 25 yr. showed the necessity of eliminating the grass in a strip at least 24 in. wide and turning the sod into the soil before planting.

Weeding during the first year at least was essential. At the end of 4 yr., trees kept free of weeds the first year averaged 15 ft. in height compared with 6.7 ft. for unweeded. On some sites weeding for two or more years may be necessary.

**Relative influence of sassafras, black locust, and pines upon old-field soils,** J. T. AUTEN. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 6, pp. 441-446).—The restoration of forests on abandoned farm land in the central hardwood region is frequently difficult because of soil deterioration from cultivation and erosion. There is need of an interim crop that can endure dryness and lay down a litter cover to restore organic matter and water-absorbing capacity. This paper discusses the results of experiments with sassafras, black locust, and pine as soil renovators. When the quantity of litter became fairly constant, at 21 to 35 yr. under good stocking, sassafras, black locust, and pines averaged approximately 7,000, 10,000, and 20,000 lb. of litter per acre respectively. Well-stocked stands of sassafras and black locust developed a litter cover more rapidly than did pines. Of the three species, sassafras contributed most completely to a restoration of a hardwood forest soil but because of its low economic value the place of sassafras is primarily that of a nurse crop. Black locust contributes indirectly to soil restoration by improving soil structure and stimulating the growth of associated species. Pines are most useful on the drier old-field soils.

**Liberation of growth stimulating materials by rooting Salix cuttings,** N. H. GRACE (*Canad. Jour. Res.*, 23 (1945), No. 3, Sect. C, pp. 85-93, illus. 1).—Physiologically active growth substances were liberated by rooting willow cuttings and retained by the solution or sand media in which rooting had occurred. Subsequent rooting of willow cutting in such media was affected with respect to the number and particularly the length of roots. Stimulation of root growth on dormant cuttings occurred while the effect on nondormant material was largely harmful. Stimulation or inhibition was related to the concentration of the liberated material. The active substance liberated by the cuttings was thermostable and comparable in its action to synthetic plant growth stimulants. Salicylates were not responsible for the activity.

**A remarkable tree-fall and an unusual type of graft-union failure,** A. J. EAMES and L. G. Cox. (Cornell Univ.). (*Amer. Jour. Bot.*, 32 (1945), No. 6, pp. 331-335, illus. 16).—A brief account is presented of the destruction of a 40-year-old grafted white fir because of a graft union failure which resulted in a clean transverse break at ground level. The edges of the cambium cylinders of scion and stock failed to unite but turned inward. From these marginal areas a transverse plate of vascular tissue was built across the trunk. There was no interlocking of the tracheids of the stock and scion.

**Giant yellow poplar cut in Maryland,** J. R. SIMMONS (*Jour. Forestry*, 43 (1945), No. 6, p. 456).—Measurements of a yellow poplar felled in Maryland showed a height of 90 ft. with a diameter at breast height of 6 ft. There were 202 annual rings. The best growth was made between 40 and 110 yr. of age. The estimated total of board feet was 6,500, plus 4.5 cords of fuel wood.

Defects in California red fir, G. P. ROBINSON and L. W. SANTFORD (*Jour. Forestry*, 43 (1945), No. 6, pp. 439-440).—On the basis of a field study in Sierra County, Calif., the authors report that the defect in red fir averaged 4 percent of the volume table figures for limby tops likely to be left on the ground, 3 percent for shake, and 1 percent for breakage. Additional deductions must be made for trees affected with butt rot.

## DISEASES OF PLANTS

The Plant Disease Reporter [May 15 and 22, 1945] (U. S. Dept. Agr., *Plant Disease Rptr.*, 29 (1945), Nos. 17, pp. 415-442, illus. 3; 18, pp. 443-466).—In addition to brief seasonal survey notes from the Emergency Plant Disease Prevention Project relating to such crops as cereals, alfalfa, potatoes, tobacco, vegetables, and miscellaneous plants, the above issues contain the following signed notes and articles:

No. 17.—Host-parasite check list revision—*Poa* (Gramineae), by F. Weiss; observations on rusts and other conditions affecting small grains in the central and southern plains region, by D. G. Fletcher; leaf rust on winter wheat in Minnesota and South Dakota, by I. W. Tervet; environmental conditions and wheat diseases in Kansas and Oklahoma, by C. O. Johnston; observations on unusual bean disease symptoms, by E. C. Blodgett and H. K. Schultz (Wash. and Idaho Expt. Stas.); and report on cinchona diseases in Guatemala, by O. A. Reinking.

No. 18.—Diseases of winter vegetables in the Salt River and Yuma Valleys of Arizona, by W. G. Hoyman; vegetable and fruit storage diseases in New York—summary of the 1944-45 storage season, by R. C. Cassell; and diseases of various crops in Idaho in 1943, by E. C. Blodgett.

Abstracts of papers presented at the second annual meeting of the Potomac Division [American Phytopathological Society] (*Phytopathology*, 35 (1945), No. 6, pp. 483-489).—Abstracts of papers by various authors are included on diseases of: Corn—*Helminthosporium turcicum* leaf blight and physiological races of the fungus, bacterial leaf blight and stalk rot, and a red leaf disease; small grains—United States distribution of physiological races of *Ustilago hordei* and of *Tilletia foetida* and *T. caries* v. wheat improvement programs; cowpea—bacterial canker; cowpea and soybean—new helminthosporium leaf spot; truck crops—fungicidal dusts and sprays for bean rust, lima bean scab (*Elsinoë phaseoli*) in Puerto Rico, cucumber mosaic virus v. desiccation in leaves, and lettuce big vein virus artificially transmitted; Hevea rubber tree—seedling chlorosis and periconia blight; American elm—phloem necrosis; and apple and pear trees—*E. piri* infection in Oregon and Washington. Papers on fungicides and equipment deal with new organics for potato and tomato, sweetpotato fungicides for seed, sprout, and prestorage treatments, tobacco plant-bed chemical treatments for weeds and diseases, fungicide assays by Easter lily scales and by agar plate v. test-tube dilution, and new spraying and dusting equipment. Miscellaneous papers deal with *Pythium* oospore organization and germination, *Alternaria solani* sporulation as affected by light and media, *Thielavia terricola* from cotton fabric and soils, and decay prevention in substructures of houses on wet sites.

[Plant disease studies] (*Expt. and Res. Sta., Cheshunt, Herit. Ann. Rpt.*, 29 (1943), pp. 29-52, illus. 4).—The following brief papers are included: Verticillium Wilt, by P. H. Williams (pp. 29-33); A Stem Rot of Tomato Caused by *Didymella lycopersici*, by E. Sheard (pp. 33-37); Experiments on the Control of Tomato Stem-rot (*Didymella lycopersici*) by Chemical Means, by W. H. Read (pp. 37-42); Stem Rot of Tomato Caused by *Phytophthora parasitica*, by P. H. Williams and E. Sheard (pp. 42-43); and The Development of Tomato Plants

Infected With Spotted Wilt (pp. 43-45) and The Interrelation Between Mosaic Infection, Soil Conditions, and Blotchy Ripening (pp. 46-52), both by I. W. Selman.

Culture types and pathogenicity of isolates of *Corticium solani*, B. R. HOUSTON. (Univ. Calif.). (*Phytopathology*, 35 (1945), No. 6, pp. 371-393, illus. 6).—From 260 isolates of *C. solani* from 15 crop plants, 52 were selected on the basis of culture characters and observed pathogenicity for further study. The isolates were separated into three culture types, A, B, and C, based on the presence or absence of a stromalike surface layer; size, abundance, and color of sclerotia; abundance and color of aerial mycelium; darkening of agar medium; and growth rate. When these 52 isolates were tested on alfalfa, cotton, pink bean, potato, spinach, sugar beet, and tomtao, a very close correlation was found between culture type and pathogenicity. Type A isolates were highly pathogenic to seedlings of all hosts tested, to sugar beet roots and crowns, and to potato stems. Type B isolates were relatively nonpathogenic to all seedlings, to potato stems, and to sugar beet crowns, but highly pathogenic to sugar beet roots. Type C isolates were relatively non-pathogenic to any host tested other than potato; this type produced an abundance of sclerotia on potato stems and tubers, whereas the other types did not. Prediction of the range of pathogenicity of any isolate of *C. solani* obtained from the important host plants can thus be more accurately made when based on the culture characters of that isolate rather than on the host from which isolated. There are 38 references.

Species of *Synchytrium* in Louisiana.—I. Descriptions of species found in the vicinity of Baton Rouge, M. T. COOK. (La. State Univ.). (*Mycologia*, 37 (1945), No. 3, pp. 284-294, illus. 4).—Of the eight species of this plant-parasitic genus considered, six are described as new.

Two new species of the Tilletiaceae from Argentina, E. HIRSCHHORN. (Wash. Expt. Sta.). (*Mycologia*, 37 (1945), No. 3, pp. 278-283, illus. 3).—The new species of smut fungi described are *Tilletia phalaridis* on *Phalaris angusta* and *Glomosporium amaranthi* on *Amaranthus* sp.

Notes on a proposed new genus and four new species of the Ustilaginales, G. L. ZUNDEL. (Pa. State Col.). (*Mycologia*, 37 (1945), No. 3, pp. 370-373).—The author describes the *Whetzelia* as a new genus of smut fungi to include the species *IV. waldsteiniae* (= *Urocystis waldsteiniae* Peck), two new species of *Ustilago*, and one each of *Urocystis* and *Entyloma*.

Observations on certain species of *Ustilago* on *Hilaria*, *Stenotaphrum*, and *Muhlenbergia*, G. W. FISCHER and E. HIRSCHHORN. (U. S. D. A. and Wash. Expt. Sta.). (*Mycologia*, 37 (1945), No. 3, pp. 318-325, illus. 2).—The following smut fungi on grasses are included: *U. affinis hilariae* n. comb., *U. muhlenbergiae*, and *U. hyalino-bipolaris* n. comb.

Specialization in *Erysiphe graminis* for pathogenicity on wild and cultivated grasses outside the tribe Hordeae, J. R. HARDISON. (Ky. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 6, pp. 394-405).—Selected groups of 360 accessions of 123 species and 8 varieties of grasses in 28 genera were inoculated with eight cultures of *E. graminis* from grasses outside the tribe Hordeae, viz, two cultures from *Avena* and one each from *Agrostis*, *Bromus*, *Dactylis*, *Festuca*, *Koeleria*, and *Polypogon*. Of these cultures, seven infected grass species outside the source genus, the isolate from *K. cristata* infected only this species, and pathogenic specialization occurred in *E. graminis* from *Avena*. No variety of *A. sativa* was resistant, but most grass species tested contained resistant individual plants. Several powdery mildew cultures had wide host ranges; a varietal designation for such races appears impracticable. As a result of these findings, it can no longer be automatically assumed that *E. graminis* occurring on a given grass species is a specialized variety restricted in infection to species of the source genus. On the contrary, inoculation results demonstrate that it may be any one of a number of powdery mildew races or a mixture of races. The new evidence showing a general lack

of specialization of races to any given genus permits recognition of the possibilities of hybridization among races, of the possible sources of inoculum in initiation of mildew infections, and other explanations of certain phases of the etiology and epidemiology of the disease.

**Susceptibility of grasses to manganese deficiency**, T. WALSH (*Nature [London]*, 155 (1945), No. 3936, pp. 429-430).—From soil-sand experiments (1943-44) in opaque glass pots with perennial and Italian ryegrass, annual meadow grass, fiorin, timothy, quackgrass ("couch grass"), and different strains of orchard grass ("cocksfoot"), it was shown that different grass genera and species and different strains of at least one grass react differently to Mn deficiency. Since the 1943 experiments were carried out under conditions similar to those in previous investigations with oats, wheat, and barley, comparisons reveal that—depending on species and strain—some grasses may be practically as sensitive to Mn deficiency as the more sensitive wheat and oats varieties and much more so than the least sensitive of these.

**Epidemiology of stem rust in western Canada**, J. H. CRAIGIE (*Sci. Agr.*, 25 (1945), No. 6, pp. 285-401, illus. 13).—Recurrent outbreaks of stem rust (*Puccinia graminis*) are reported to have been responsible, during the present century, for much damage to cereal crops in western Canada, and particularly to wheat. The disease regularly appears first in southern Manitoba, then northward and westward. Local sources of infection are virtually absent. Almost invariably inoculum is present in the air earlier over Manitoba than over Saskatchewan and earlier over Saskatchewan than over Alberta, and it is always present in advance of infections. The initial inoculum consists largely—if not entirely—of wind-borne spores originating outside Canada. The similarity year by year in the amount of infection and in the physiologic races present in western Canada and in the northern Mississippi Valley strongly suggests that the bulk of this inoculum originates in the latter area.

There is an evident association between years of high spring and summer rainfall and those of medium and heavy stem rust infection, although the association seems also to depend on the presence of some other factors, the chief one apparently being the amount of inoculum. The excess rainfall of the medium and heavy rust years is not concentrated in any one month but is spread over April-August—the April-May and July rainfall, however, being more consistently above average than that in June and August. Similarly, years with above-average frequency of days with rain during spring and summer tend to be associated with years of medium to heavy rust infection. Misty and foggy weather is comparatively rare in the area and is thus of little consequence in promoting epidemics. The mean temperature of the growing season tends to be slightly higher in light than in heavy rust years, but slightly lower than in medium rust years. The mean minimum temperature for June 20-August 4 tends to be somewhat higher in the heavy rust years and to some extent in the medium rust years. The chief effect of the lower minimum temperature in the light rust years is believed to retard rust development rather than to decrease the number of infections. No relationship appears to exist between the number of hours of bright sunlight during the growing season and the occurrence of epidemics. A close association was evident in Manitoba between periods of south wind and those of high stem rust and leaf rust spore concentrations in the air during June 12-July 20; the association was somewhat less evident in Saskatchewan and seemed largely to disappear in Alberta.

Broadly speaking, it does not appear that winds favoring introduction of spores into different parts of western Canada were more frequent or of greater duration in heavy than in light rust years. Among the factors contributory to more frequent and severe outbreaks in Manitoba and eastern Saskatchewan than in western Saskatchewan and Alberta is their closer proximity to the source of inoculum, the

greater number of hours of wind favoring its introduction, and their somewhat higher rainfall and temperature. The time at which field infections appear seems to be determined, not by the stage of crop maturity, but by the time of inoculum arrival and the subsequent weather. To marked extent, the establishment of epidemic conditions in western Canada seems to depend on the early arrival of an abundant supply of wind-borne inoculum. In the medium rust years, wind-borne inoculum becomes plentiful considerably later than in the heavy rust years; in light rust years (one exception) it has not been abundant at all or has become abundant only late in the season. With respect to the length of time required for wheat to mature there has been little or no difference between the heavy and light rust years. In the heavy rust years, however, seeding was usually a few days later than the average; in the medium rust years, moderate to severe infection became established only after the fruiting period of the bulk of the crop was at least about half completed. The interrelation of the various factors influencing development of stem rust in western Canada is discussed, and an explanation is given in justification of the widely held belief that a period of moist warm weather is frequently a precursor of a heavy stem rust attack.

Foot rot (*Phoma sp.*) of flax, A. E. MUSKETT and J. COLHOUN (*Nature [London]*, 155 (1945), No. 3934, pp. 367-368, illus. 1).—Since first recorded in Ireland in 1921 this disease has been noted to occur consistently in Northern Ireland, although the responsible species still awaits identification. Since the fungus may be seed-borne, a large number of laboratory seed disinfection tests were carried out with some of the newer fungicides. The results with New Improved Ceresan and Arasan were so promising that they were to be tried on a commercial scale in 1945.

A Diplodia associated with concealed damage in peanuts, C. WILSON. (Ala. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 6, p. 480).—Isolations by methods described were made from peanut seeds with concealed damage—collected from 12 sections of southeastern Alabama. A *Diplodia* tentatively identified as *D. theobromae* constituted 95 percent of all isolates and was obtained from 65 percent of the damaged seeds. Other organisms isolated were *Sclerotium bataticola*, *Fusarium* spp., *Aspergillus*, *Penicillium*, *Rhizopus*, and bacteria. Neither the disinfecting solutions nor the media affected the relative proportions of the different organisms obtained.

Late blight forecasting service, I. E. MLLHUS ET AL. (Iowa Expt. Sta.). (*Phytopathology*, 35 (1945), No. 6, pp. 463-479, illus. 1).—A report is given of the late blight forecasting service undertaken by the War Service Committee of the Upper Mississippi Valley Plant Pathologists. Data are presented on the relationship of temperature and rainfall to prevalence and destructiveness of potato late blight (*Phytophthora infestans*) in Illinois, Indiana, Iowa, Michigan, Minnesota, Nebraska, North and South Dakota, Ohio, and Wisconsin and the adjacent Canadian provinces of Manitoba and Saskatchewan. The conclusion was reached that, given the weekly temperature and rainfall and assuming inoculum to be present, the prevalence and destructiveness of late blight can be predicted.

*Fusarium* seed-piece decay of potatoes on Long Island, H. S. CUNNINGHAM and O. A. REINKING. (N. Y. State Expt. Sta.). (*Conn. Agric. Expt. Sta. Bull.* 270 (1945), No. 3, pp. 8-9, illus. 2).—Preliminary results have shown promise of control by seed treatment of the seed-piece decay caused by *Fusarium* spp.; *F. coeruleum* was found most prevalent in this area, but *F. solani* *striatum* and *F. sambucinum* f. 6 were also isolated from dry rot of tubers.

Potato ring-rot and its control, G. H. STARR and W. A. RIEDL (*Wyoming Sta. Bul.* 270 (1945), pp. 16, illus. 10).—According to recent surveys, bacterial ring rot is increasing in the United States, and all possible precautions should be taken

to keep down the losses therefrom. This bulletin present information on the symptoms, means of identifying the disease, and control methods, including detailed recommendations which should enable growers to keep their seed potatoes free from ring rot and to eliminate it where present.

The comparative effectiveness of certain cutting-knife treatments in the control of ring rot of potatoes, W. A. KREUTZER, W. J. HENDERSON, and G. H. LANE. (Colo. Expt. Sta.). (*Amer. Potato Jour.*, 22 (1945), No. 5, pp. 127-133).—Through use of a 5-gal. tank of 0.2 percent  $HgCl_2$  as a disinfectant for the rotary cutting knife, 35 sacks of clean but unwashed Red McClure seed potatoes were cut, test lots being cut at 5-sack intervals after contaminating the knife with *Corynebacterium sepedonicum*. Complete protection was obtained in test lots cut after the cutting of 5, 10, 15, and 20 sacks of potatoes; ring rot appeared in the lot after cutting 25 sacks. Field plantings of the 35 sacks of cut seed produced plants showing only one case of infection. When 15 sacks were cut, using a 1-gal. tank of 0.2 percent  $HgCl_2$ , 5 sacks were cut safely, but 4 percent of disease appeared in test lots after cutting 10 sacks; no protection was afforded after cutting 15 sacks. Use of boiling water (199° F. at 7,600 ft. altitude) to sterilize the knife gave perfect protection. Santophen 2 and Santophen 7 (commercial mixtures of *o*- and *p*-benzylphenol) at 0.5, 0.1, and 0.05 percent failed to prevent infection. Plots planted with tubers cut with use of the 0.05 and 0.1 percent solutions as knife disinfectants produced highly significant increases in percentages of diseased plants when compared with plots for which the 0.5 percent solution had been used; discoloration of cut tuber surfaces and some reduction in plant vigor followed use of this strength. Analysis of the severity indexes of plants having treatments followed by infection in all plots failed to reveal any constant trend.

Control of the potato-root eelworm *Heterodera rostochiensis* Wollenweber by allyl isothiocyanate, C. ELLENBY (*Nature [London]*, 155 (1945), No. 3940, p. 544).—A preliminary account of promising results in control.

A storage rot of potatoes caused by a fluorescent organism resembling *Pseudomonas fluorescens* (Flügge) Migula, E. H. GARRARD (*Canad. Jour. Res.* 23 (1945), No. 3, Sect. C, pp. 79-84, illus. 5).—Inoculations with the bacterial strain described induced rapid blackening and rotting of tubers at temperatures below 20° C., the most extensive decay occurring at 5°. After successive transfers on culture media, the organism lost its pathogenicity within 6 mo.

Report on cooperative tests with the hot water treatment of sugarcane, P. H. DUNCKELMAN and C. W. EDGERTON (*Sugar Bul.*, 23 (1945), No. 18, pp. 138-141).—Investigations to determine the effects of treating seed cane with water at 52° C. were continued through 1944 (E. S. R., 91, p. 696). The results of 4 years' work are presented in this report—largely in tabular form—and cane was planted for tests in the fifth year; these results conformed closely with those of previous years, increased yields being obtained by treatment at 52° for 20 min.

Report to Contact Committee, I. L. FORBES and P. J. MILLS (*Sugar Bul.*, 23 (1945), No. 18, p. 141).—Data are presented in tabular form on the effects of red rot and mosaic on yields of commercial varieties and promising unreleased seedlings of sugarcane.

A probable virus disease of sweet potato, C. G. HANSFORD (*East African Agr. Jour.*, 10 (1944), No. 2, pp. 126-127).—A preliminary account is given of a disease in East Africa suspected of spread by white flies (Aleyrodidae). The symptoms vary considerably according to variety. Some of the narrow-leaved varieties show severe stunting, with general yellow-green appearance of the field; individual leaves usually exhibit an indefinite mosaic pattern or in other varieties a light yellowish green banding along the veins. The broad-leaved varieties show more variation in leaf symptoms and in general reaction to the trouble. The disease is considered potentially very serious.

Electron shadow micrography of the tobacco mosaic virus protein, R. C. WILLIAMS and R. W. G. WYCKOFF (*Science*, 101 (1945), No. 2632, pp. 594-596, illus. 3).—Two improvements are described in the use of shadow electron micrography for observing particles of macromolecular dimensions. One involves the substitution of gold for chromium as shadowing metal; the thinner gold film gives a truer representation of the shape of particles so small that shape and size are significantly altered by the thickness of the shadowing metal deposited on them. The other modification consists in metal-shadowing small particles deposited on a very smooth surface such as that of polished glass and the handling of this metal film as a replica of the glass surface and the particles resting on it. This technic permits the photographing of particles whose direct observation is disturbed by the fine structure brought out by shadowing a collodion substrate. Application of these methods to tobacco mosaic virus protein demonstrated that its fibrils are rods about 125 a. u. both in height and breadth. Though the rods appear segmented, these segments have not been found to have a length that is constant or a small integral multiple of an underlying unit.

X-ray crystallographic measurements on a single crystal of a tobacco necrosis virus derivative, D. CROWFOOT and G. M. J. SCHMIDT (*Nature [London]*, 155 (1945), No. 3939, pp. 504-505, illus. 3).—A preliminary account.

The effects of carcinogens on growth of fungus hyphae, E. and L. REESE (*Growth*, 9 (1945), No. 2, pp. 177-187, illus. 1).—Mushrooms are often severely deformed by volatile impurities in crude kerosene or natural gas; the nature of the outgrowth and its association with crude petroleum led to the idea that the condition might be comparable to cancer, and if so a carcinogen might be expected to have some effect on fungus growth. In the authors' experiments, 1:2:5:6-dibenzanthracene at 1 : 50,000 was found effective in reducing the rate of increase of growth during the log phase in mushroom hyphae; the reduction of rate was greater on a faster growing fungus (*Chaetomium*). Time of measurement proved of the utmost importance in demonstrating differences; second-day results with mushrooms showed far greater inhibition than first-day results. It is believed probable that the greater differences in *Chaetomium* may have been due to its relative position on the growth curve. Though stimulation—observed at 1 : 400,000 in the early experiments—could not be verified, it is believed not impossible that this carcinogen may under certain conditions be stimulative as well as retardative of germ-tube and hyphal growth.

Ripening of the onion bulb and infection by *Botrytis* species, M. HOLDSWORTH and O. V. S. HEATH (*Nature [London]*, 155 (1945), No. 3933, p. 334).—The falling over of the leaf blades while several of them are still green at the ripening of the bulb is said to be purely mechanical and connected with the development of the onion bulb. After the blade of the last leaf has emerged and there are no more to provide the solid core of the neck the latter becomes a hollow tube which soon buckles and collapses under the weight of the green blades. If the last leaf emerges fully before collapse of the neck the plant has a more or less open pore communicating directly by the neck with the bulb interior. A number of cases were found in which the swollen bulb scales were infected (apparently with *Botrytis* spp.) while the surrounding swollen leaf bases appeared healthy; it would thus appear that this provides a way of infection of the bulb. Another likely path is via the pores of the older leaves, since these sag open as the leaves wither and so provide pockets for the lodgement of air-borne spores and probably also fairly high humidities for their germination.

Control of white rot in onions, J. R. BOOER (*Nature [London]*, 155 (1945), No. 3930, pp. 241-242).—A preliminary report on successful control by use of calomel dust.

**Use of calomel on onions.** F. O. MOSLEY (*Nature [London]*, 155 (1945), No. 3940, pp. 544-545).—Promising results in controlling *Anguillulina dipsaci* by HgCl<sub>2</sub> are reported, in addition to the already established control of onion fly and white rot by this chemical.

**Galls on the roots of citron-watermelon hybrids.** M. N. WALKER. (Fla. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 6, pp. 480-482, illus. 1).—The author reports the finding of galls on the roots of citron and citron-watermelon hybrids at Leesburg and Gainesville, Fla. These galls differed radically in appearance from crown gall or root knot; no causal factor or economic importance is attributed to them.

**The problem of virus diseases in stone fruits in Utah.** B. L. RICHARDS and A. S. RHoads (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 2, pp. 3, 12-14, illus. 2).—Investigations of the past 5 yr. indicate that the troubles most responsible for serious orchard degeneration in Utah are virus in nature. Present information on these diseases is briefly summarized, including control measures; the latter concern the selection of budwood only from bearing trees of known fruit and vegetative characters, production performance, and freedom from diseases, thus eliminating unnecessary multiplication and dissemination of viruses and of worthless or undesirable off-type trees and reducing objectionable diversity within a variety.

**Insect transmission of the "swollen-shoot" virus in West African cacao.** H. E. Box (*Nature [London]*, 155 (1945), No. 3942, pp. 608-609).—In the tests with four recognizable "strains" of virus reported in this preliminary account, *Ferrisia virgata*, *Pseudodoccus extitabilis*, and the citrus mealybug transmitted the infection; tests with an aphid and a psyllid gave negative results. The selective transmissions obtained suggested that more than one distinct virus may be concerned in the complex.

**A progress report on citrus tree decline.** L. J. KLOTZ. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 30 (1945), No. 8, pp. 242-244; *Citrus Indus.*, 26 (1945), No. 7, pp. 7, 13, 15).

**Report on "quick decline" inspection in California.** A. F. CAMP. (Fla. Expt. Sta.). (*Citrus Indus.*, 26 (1945), No. 6, pp. 5, 8).

**The "tristeza" disease of sour orange rootstock.** H. J. WEBBER. (Calif. Citrus Expt. Sta.). (*Citrus Indus.*, 26 (1945), Nos. 5, pp. 18-20; 6, pp. 18-19, 20-22).—The history of this disease as published by the author and various other workers is reviewed (12 references) and its present status discussed. On the basis of the known facts, it is believed that incompatibility of the sour orange stock with sweet orange, mandarin, or grapefruit or the particular variety of sour orange used as stock are eliminated as possible causes of tristeza, and it is deemed highly improbable that the development of some substance lethal to the sour orange root, that soil or climatic conditions, or that trace element deficiencies are responsible. On the other hand, the available evidence is believed to point to a virus etiology.

**Elgon dieback disease of coffee.** C. A. THOROLD (*East African Agr. Jour.*, 10 (1945), No. 4, pp. 198-206, illus. 2).—The planting of shade trees and especially the use of the quick-growing ones, followed by establishment of "permanent" trees, was found to be the best way of controlling the disease known in Kenya Colony as "Elgon dieback." Where shade—natural or artificial—cannot be employed the resistant type of coffee should be established without shade, but the author considers it inadvisable to use the resistant type and to plant shade at the same time. Where shade trees can be grown and a new variety is to be planted, it would be preferable to employ some selection known to produce coffee of good quality, such as Blue Mountain, which is said to be resistant to coffee berry disease and—with shade—to avoid both Elgon dieback and "hot and cold," the latter being

the name given to certain characteristics associated with the pyramid-shaped coffee trees with bunched growth habit, typical of Arabica coffee at the higher elevations. It is the author's belief that the last two diseases are due to carbohydrate deficiency under conditions where the N supply of the soil is adequate or possibly excessive.

**Metastatic (graft) tumors of bacteria-free crown-galls on *Vinca rosea*, P. R. WHITE** (*Amer. Jour. Bot.*, 32 (1945), No. 5, pp. 237-241, illus. 7).—Tissue cultures were isolated from crown galls of Madagascar periwinkle rendered bacteria-free by heat therapy. These exhibited very rapid discoordinate growth in vitro, and when grafted back onto healthy host plants produced typical tumors regularly exceeding in size those generally produced by direct multiple needle puncture inoculation of *Phytoponas tumefaciens*. The possible implications of this increase in growth capacity of bacteria-free over bacteria-containing tumors are discussed, and the possibility of using these cultures in studying latex and rubber production is also suggested.

**The effect of artificial light on germination of urediospores of *Phragmidium mucronatum* (Fr.) Schlecht, V. W. COCHRANE**. (Cornell Univ.). (*Phytopathology*, 35 (1945), No. 6, pp. 458-462).—Urediospores of the rose leaf rust fungus were germinated on the surface of 2 percent water agar under artificial light passed through filters removing the infrared and ultraviolet components. At an intensity of 1,250 ft.-c., both rate and total germination were depressed. Under the 200-ft.-c. intensity, spores were slightly slower in germinating than controls at the same temperature in darkness; at 2.4 ft.-c., there was no effect at all. Lateral illumination at the lowest intensity had no influence on direction of growth of germ tubes. Exposure of dry spores to light at 1,250 ft.-c. for 24 hr. had no effect on their germinability.

**Some possibilities for developing resistance to disease in trees, A. J. RIKER**. (Wis. Expt. Sta., U. S. D. A. et al.). (*Amer. Nurseryman*, 81 (1945), No. 12, pp. 5-7, illus. 3).—Condensation of an address before the Wisconsin Nurserymen's Association, including brief discussions of the mechanism of disease resistance and means of its development, some representative problems among tree diseases, and the possibilities in vegetative propagation.

**A new *Rhabdogloewum* associated with *Rhabdocline pseudotsugae* in the Southwest, D. E. ELLIS and L. S. GILL**. (N. C. Expt. Sta.). (*Mycologia*, 37 (1945), No. 3, pp. 326-332, illus. 2).—*Rhabdogloewum hypophyllum* n. sp., parasitic on needles of Douglas fir, is discussed and described.

**Some new species of fungi on *Libocedrus*, E. K. CASH**. (U. S. D. A.). (*Mycologia*, 37 (1945), No. 3, pp. 311-317, illus. 5).—The fungi here described from California incense cedar are *Parksia libocedri* n. gen. and sp., *Camaropycnis libocedri* n. gen. and sp., and *Tryblidiella macrospora* n. sp.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**Efficient handler for small mammals, L. J. THOMAS**. (Univ. Ill.). (*Science*, 101 (1945), No. 2628, p. 496, illus. 1).—"The gadget consists of a wire cloth cone 18 in. long of 0.5-in. mesh for use with rats; a 0.25-in. mesh is better for mice."

**Effects of a tornado on bird life, H. E. MCCLURE**. (Iowa Expt. Sta. et al.). (*Auk*, 62 (1945), No. 3, pp. 414-418, illus. 3).—In western Iowa, the small town of Portsmouth was struck by a tornado on July 9, 1940; an estimated 1,000 birds were killed in the town's 100 acres, and following the storm 87 were found alive. Birds least affected by wind and torrential rain were those roosting in buildings or nesting in tree hollows; only 7 species appeared to have survived. During the following summer months mourning doves, robins, red-headed woodpeckers, house wrens, and English sparrows continued their nesting activities. According to a survey the last week of August the bird population (excluding English sparrows)

averaged 0.53 per acre as compared with 12.7 at a town a few miles away; it was still only 4 percent of normal. These observations reveal the remarkable stability of established breeding-bird populations; the void created by a tornado was not filled by an influx of birds from nearby undisturbed areas.

The economic importance of the house sparrow (*Passer domesticus* L.): A review, H. N. SOUTHERN (*Inn. Appl. Biol.*, 32 (1945), No. 1, pp. 57-67).—This paper summarizes (22 references) the known facts on the economic importance and diet of the English sparrow.

Use of wood duck nesting boxes in Wheeler Wildlife Refuge, Alabama, P. BRYAN (*Jour. Tenn. Acad. Sci.*, 20 (1945), No. 1, pp. 35-40).—Of 98 nesting boxes installed early in 1941 for wood ducks in the Wheeler Refuge, 53 were used by gray squirrels, 9 by wood ducks, 5 by flying squirrels, 4 by opossums, and 2 by screech owls. The height of the nest location apparently influenced the extent of occupancy, but no correlation was observed between distance from water, kind of tree in which located, or distance from a clearing.

A progress report on the marsh and aquatic plant problem: Reelfoot Lake, J. H. STEENIS and C. COTTAM (*Jour. Tenn. Acad. Sci.*, 20 (1945), No. 1, pp. 6-19).—Improvement of the vegetation for waterfowl in this lake requires a thorough understanding of the existing ecology of the dense marsh and aquatic growth so that control of the undesirable plants will result in an increase of the desired species. The methods found effective in controlling several pest plants are described, viz., for *Zizaniopsis miliacea*, *Nuphar advena*, *Nelumbo pentapetala*, and *Ceratophyllum demersum*. Control of an obnoxious species should not in itself be considered conclusive. Since it may result in the appearance of another weed species previously suppressed. Thus control of *Zizaniopsis* where *Nuphar* is suppressed results in an immediate extension of the zone of growth for the latter, and control of a large pad-leaf species where *Ceratophyllum* exists as an understory may result in a dense growth of this plant. On the other hand, *Zizaniopsis* control in areas lacking *Nuphar* but having a suppressed growth of *Polygonum hydropiperoides* results in a solid growth of this valuable duck food plant; if there is no understory growth, other desired marsh species may be propagated. *Nuphar* control contributes to an environment better suited for *Najas* and *Potamogeton* spp. when control is conducted in the more exposed areas where *Ceratophyllum* dominates; *Nuphar* control is also beneficial when practiced in areas adjacent to *Brasenia* beds. *Nelumbo* control—like that of *Nuphar*—is beneficial in the more exposed *Ceratophyllum* areas and where it encroaches on *Brasenia* and on *Potamogeton* communities.

The distribution of stream fish in the vicinity of Mountain Lake, Virginia, G. W. BURTON and E. P. ODUM (*Ecology*, 26 (1945), No. 2, pp. 182-194, illus. 2).—A detailed longitudinal survey of fishes in five streams near Mountain Lake, Va., over a three-summer period (1939-41)—with stations established every 1-2 miles and worked extensively with seines and dip-nets—showed a marked longitudinal succession of fishes in all the streams, changes being more pronounced the greater the altitude range but distinct differences occurring with but little change therein. Of the various environmental complexes considered, temperature, stream size, and gradient of flow appeared the most important factors in determining distribution within these streams. A temperature of 19° C. consistently marked the downstream limit of brook trout; introduced rainbow trout occurred mostly in waters warmer than 19°, but were well established only where the gradient was 100 ft./mile or greater. In two streams of different size there was a gradual increase in number of species longitudinally, and headwater species tended to range the length of the stream. Gradient of flow appeared very important and special attention was paid to it; the discontinuous distribution of a number of wide-ranging species seemed to be especially well correlated with sharp changes in stream gradient. No obvious

correlation between pH and observed distribution was found, although pH may influence abundance. A conspicuous decrease in both species and numbers in the lower half of one creek may possibly be correlated with such biotic factors as impoverished land or by the presence of the pickerel *Esox niger*, which appeared about where the population fell off. Of the 31 native species, only 12 were common to both drainages.

The fishes of the Kanawha River system in West Virginia and some factors which influence their distribution, J. ADDAIR (*Ohio State Univ., Abs. Doctoral Diss.*, No. 46 (1945), pp. 9-17, illus. 1).

Fish distribution, Norris Reservoir, Tennessee, 1943, I-III (*Jour. Tenn. Acad. Sci.*, 20 (1945), No. 1, pp. 103-138, illus. 20).

I. Depth distribution of fish in Norris Reservoir, E. R. Cady (pp 103-114).—Fish were found to vary widely in their depth distribution in Norris Reservoir. The findings are limited to those fish which are within 8 ft. of the bottom. In general the sport fisherman may expect to have best results by casting in spring and by deep trolling in summer.

II. Depth distribution of fish in relation to environmental factors, Norris Reservoir, J. S. Dendy (pp. 114-135).—Efforts were begun in 1943 to determine the relationship of dissolved oxygen and temperature to the depth distribution of fish in this reservoir, in the hope that the distribution of fish might be determined by making periodic temperature and/or oxygen determinations. As oxygen depletion progressed beneath the density current, between the upper warm strata and the lower cold strata, fish tended to move through the layer to the warm well-oxygenated water immediately above it. Oxygen content did not appear to influence fish distribution where 3 p. p. m. or more were present. The distribution of the greater concentrations (middle 50 percent) of fish of most species was rather closely related to water temperatures; most species tended to move to deeper water as the summer progressed and as the isotherms moved downward. Though the 1944 data had not been analyzed, a superficial examination suggested that the findings were similar to those of 1943. It is believed that the information on depth distribution, coupled with periodic temperature determinations at a number of stations and enough oxygen determinations to note the location of the density current, will be adequate to provide fishermen with reasonably accurate information on the depth distribution of fish in this reservoir. Circumstantial evidence suggests that the light and pressure were not significant factors in the depth distribution of most species. Shelter was present in about equal quantities at all depths and therefore may be eliminated as a deciding factor in depth distribution. Food for adult game fish was also probably present at all depths which they occupied. Spawning obviously influenced the depth distribution of some fish for a short period. Of the various factors noted, temperature seemed to be the most significant in influencing fish distribution.

III. Relation of the bottom to fish distribution, Norris Reservoir, O. F. Haslbauer (pp. 135-138).—For nine species of fish, information on nearness to the bottom—regardless of depth—is tabulated and discussed. The findings suggest that the angler who fishes near the bottom may expect to have the best catch because the fish tend to be concentrated there.

Fish migrations into the Norris Dam tailwater in 1943, R. W. ESCHMEYER and D. E. MANGES (*Jour. Tenn. Acad. Sci.*, 20 (1945), No. 1, pp. 92-97, illus. 1)—In the fall of 1942 a considerable number of white bass, sauger, and largemouth bass migrated to the tail water of Norris Dam, Tenn. Information on the movement from the time it was first noted to about June 1, 1943, has been previously noted (E. S. R., 91, p. 436); later developments are briefly discussed here.

The size distribution of the bluegill and the largemouth black bass in Reelfoot Lake, Tennessee, R. J. SCHOFFMAN (*Jour. Tenn. Acad. Sci.*, 20 (1945), No. 1, pp. 98–102, illus. 4).

**Effect of a year-round open season on fishing in Norris Reservoir**, R. W. ESCHMEYER and D. E. MANGES (*Jour. Tenn. Acad. Sci.*, 20 (1945), No. 1, pp. 20–34, illus. 1).—An extensive inquiry was conducted on this reservoir to note changes in the fish yields resulting from the abandoning of the closed season in 1944. The major findings, based on 18,095 creel census records and 116 man-days of counting fishermen, here detailed and analyzed, led to the conclusion that the closed season should preferably be abandoned on this and other Tennessee Valley Authority reservoirs until there is definite evidence that a closed season is necessary or desirable.

**The white bass in TVA waters**, H. H. HOWELL (*Jour. Tenn. Acad. Sci.*, 20 (1945), No. 1, pp. 41–48).—The white bass is said to be unpredictable both as to changes in abundance from year to year and in location within a reservoir. At times, it is taken in considerable numbers in main-stream reservoirs themselves and is the leading game fish in the tail waters at the head of the reservoirs. It shows preference for running water, though it seems to have increased in numbers as a result of changing the Tennessee River into a series of impoundments. The species apparently can spawn successfully in the reservoirs and does not necessarily ascend tributary streams to spawn. Its life span in TVA waters appears to be short; a few attain the age of 4 yr. The white bass travels in schools and is migratory. Growth and condition vary greatly from year to year. The species maintains itself without restocking, and apparently continues to be one of the major game fish in TVA waters even though little is known about its environmental requirements.

**The ecological relations of pike**, *Esox lucius* L., and waterfowl, V. E. F. SOLMAN (*Ecology*, 26 (1945), No. 2, pp. 157–170, illus. 2).—The increase in agriculture on the prairies and the decrease in precipitation has reduced their availability as breeding grounds for waterfowl; the northern breeding areas have, therefore, assumed greater importance in maintaining waterfowl populations in North America. Predation on young waterfowl by pike was reported from 44 percent of the areas under observation by 207 observers; 45 percent of those eaten were less than a week old, and diving ducklings were taken three times as often as surface species. Pike 19 to 30 in. long were responsible for 71.5 percent of all predation on waterfowl, although this size range was only 23.3 percent of all pike taken which were large enough to prey on them. On the average, ♀ pike contained three times the weight of food found in ♂♂, although they averaged only 1.14 in. longer; ♀♀ comprised 47.8 percent of the population, but were responsible for 56 percent of the predation. This greater predation and food content are believed related to their higher observed growth rate. Predation by pike may destroy one young waterfowl per 0.6 acre of water per season in areas like the Saskatchewan River delta. Since the combined areas of this and the Athabasca River delta comprise over 900,000 acres as normal summer levels, the destruction of young waterfowl by pike may amount to 1,500,000 per year, or 9.7 percent of the average annual production of these areas.

**Natural mortality among Indiana bluegill sunfish**, W. E. RICKER (*Ecology*, 26 (1945), No. 2, pp. 111–121).—The total annual mortality rate among bluegills (*Lepomis macrochirus*) of legal size in three northern Indiana lakes was found to be 60 to 77 percent, over a broad range of ages and sizes. On two small rather heavily fished lakes the rate of exploitation by fisherman was 16 to 36 percent per year; the larger figure is at the prewar level. The difference, corresponding to a calculated "natural" rate of 47 to 56 percent cannot readily be ascribed to

predation. While disease may be involved, there is also the possibility that natural mortality is for the most part independent of external agents, i. e., that senility overtakes the fish of each year class over a wide range of ages and sizes.

**Animal pests** (*Expt. and Res. Sta., Cheshunt, Herls., Ann. Rpt.*, 29 (1943), pp. 53-59).—The following are included: Red Spider-Mite (*Tetranychus telarius* L.), by E. R. Speyer (pp. 53-57); Wireworm (*Agriotes obscurus* L.) (pp. 57-58); and Root-Knot Eelworm (*Heterodera marionii* Cornu) (p. 59).

**Biological notes on Atypus bicolor** Lucas (Arachnida), M. H. and K. E. MUMA. (Md. Expt. Sta.). (*Ent. News*, 56 (1945), No. 5, pp. 122-126).—Tarantulas of this genus are known commonly as purseweb spiders; notes are here presented on *A. bicolor*—a species living on the eastern seacoast of the United States—with respect to the web, the egg and young, and the ♀ behavior.

**New and interesting spiders from Maryland**, M. H. MUMA. (Md. Expt. Sta.). (*Biol. Soc. Wash. Proc.*, 58 (1945), pp. 91-104, illus. 19).—Includes six new species.

**An ecological study of the spiders of a river-terrace forest in western Tennessee**, W. W. GIBSON (*Ohio State Univ., Abs. Doctoral Diss.*, No. 46 (1945), pp. 47-55).

**Entomological notes** (*Agr. Jour. [Fiji]*, 16 (1945), No. 1, pp. 8-11).—The following are included: Food Preferences of Some Beetles for Stored Products, by R. J. A. W. Lever (p. 8); The Larger Cabbage Moth *Crocidolomia binotalis* Zell (pp. 9-10); Fruit Fly Parasites and Host Plants (p. 10); and The Predaceous Plant Bug *Cyrtorhinus* in Fiji (p. 11).

**Australian insects: An introductory handbook**, K. C. McKEOWN (Sydney: Roy. Zool. Soc. N. S. Wales, *Austral. Zool. Handb.*, 1944, 2. ed., rev., pp. 303, over 300 illus.).

**Separatory funnels as experimental chambers in studies of insect physiology**, C. M. WILLIAMS (*Science*, 101 (1945), No. 2633, p. 622).—In studies of insect physiology an array of experimental chambers is often required within which the animals can be exposed to various gases and vapors; attention is called to the fact that separatory funnels fulfill the requirements, though apparently not previously used for this purpose.

**Insect epicuticle**, R. DENNELL (*Nature [London]*, 155 (1945), No. 3940, p. 545).—Data briefly presented indicated that "variations in lipid distribution in the cuticle must clearly be taken into account as one of the many factors determining the effectiveness of an inert dust insecticide on different insects."

**Review of United States patents relating to pest control [January-December 1944]**, R. C. ROARK (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Rev. U. S. Pat. Relat. Pest Control*, 17 (1944), Nos. 1, pp. 6; 2, pp. 5; 3, pp. 5; 4, pp. 7; 5, pp. 7; 6, pp. 5; 7, pp. 5; 8, pp. 5; 9, pp. 4; 10, pp. 4; 11, pp. 7; 12, pp. 5).—A continuation of this series (E. S. R., 91, p. 176).

**Cheaper insect control possible**, L. P. DITMAN. (Md. Expt. Sta.). (*Food Packer*, 26 (1945), No. 6, pp. 58, 60, 62, illus. 2).—This is a discussion of liquefied gas aerosols, including their preparation, means of applying, rate of application, and the 1944 experiments, with a brief forecast as to their future. In the tests against a number of insects attacking truck crops, promising results are reported for aerosols containing nicotine or DDT; derris resins up to 10 percent failed to give satisfactory kills and tended to clog the nozzles.

**Quarterly bibliography of insecticide materials of vegetable origin**, No. 29 (October to December 1944), R. M. JOHNSON (*Bul. Imp. Inst. [London]*, 43 (1945), No. 1, pp. 29-34).—A continuation of this bibliography (E. S. R., 93, p. 313).

**Introducción al cultivo de plantas insecticidas en la República Mexicana [Introduction to the culture of insecticidal plants in Mexico]**, J. SAMANTEGO DÁVILA (*Fitófilo*, 3 (1944), No. 6, pp. 8-48, illus. 3).

DDT is poisonous: Tolerance level deemed necessary when it is used in human food, H. O. CALVERY (*Food Packer*, 26 (1945), No. 5, pp. 61-62).

Could the widespread use of DDT be a disaster? E. H. STRICKLAND (*Ent News*, 56 (1945), No. 4, pp. 85-88).—On the place of DDT in insect control and the dangers of upsetting the ecological equilibria should it be used in any widespread attempts at exterminating insect pests.

Calcium in prevention and treatment of experimental DDT poisoning, R. VAZ, R. S. PEREIRA and D. M. MALHEIRO (*Science*, 101 (1945), No. 2626, pp. 434-436).—The satisfactory results obtained by administration of calcium gluconate in preventing and treating dogs experimentally intoxicated with DDT suggest that the apparent neurologic symptoms observed are due to hypocalcemia and not to the direct action of DDT on the nervous system.

A catalogue of the parasites and predators of insect pests.—Section 1, Parasite host catalogue, IV (*Belleview, Ont.: Imp. Parasite Serv.*, 1944, sect. 1, pt. 4, pp. 130+).—"This catalog is merely a guide to the recorded relationships of parasites and predators, compiled from the literature." Section 1 of part 4 (E. S. R., 93, p. 312) lists the insect parasites of species of the orders Hymenoptera and Isoptera; the insect parasites of the terrestrial Isopoda have also been included. The host insects are arranged under genera in alphabetical order, with specific names also in alphabetical order. Under each host species its parasites are listed in the same manner. The parasites cited in the text are indexed according to the system followed with the host species. The information given includes the name, family, and order of the hosts and parasites, the country of record, and bibliographic references. An alphabetical list presents the host synonymy not shown in the text, and an index of parasites is provided.

Tillage methods in grasshopper control, G. B. SPAWN. (Coop. U. S. D. A.). (*South Dakota Sta. Bul.* 379 (1945), pp. 16, illus. 7).—This publication contains a general discussion of tillage methods and related practices for grasshopper control, and offers suggestions for their use under practical conditions. Among those included are examination of fields and margins in late September to determine amount of egg deposition; deep plowing where there is no danger of soil blowing or excessive drying; next to deep plowing, disking, duckfoot subsurface cultivation, listing, and straight blade type subsurface cultivation; use of spring-tooth harrow in late fall or early spring to reduce hatching; disk any cultivated land which is idle through the summer and fall; tilling fields immediately after harvest; and use of poison bait in fence rows and edges of pastures. A discussion of experimental methods used is appended.

The North American species of the genus *Isochaetothrips* Moulton (Thysanoptera: Thripidae), J. C. CRAWFORD (U. S. D. A.). (*Ent Soc. Wash. Proc.*, 47 (1945), No. 6, pp. 179-182).—Includes five species—one of which is new—with a key for identification.

Rabbitbrush aphid notes, G. F. KNOWLTON. (Utah Expt. Sta.). (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 2, p. 43).—Brief notes on aphid species taken on rabbitbrush (*Chrysothamnus*).

Additions to the Aleyrodidae of Mexico (Hem.: Hom.), W. W. SAMPSON (*An. Escuela Nac. Cien. Biol. [Mexico]*, 3 (1944), No. 3-4, pp. 437-444, illus. 4; *Span. abs.*, p. 444).—Includes two new genera and species of whiteflies.

The genus *Chlorotettix* (Homoptera: Cicadellidae) in Mexico, D. M. DELONG. (Ohio State Univ.). (*Lloydia*, 8 (1945), No. 1, pp. 1-30, illus. 5).—Besides 17 new species here described, 10 previously described are included, and a key to the species or groups of species of this genus of leafhoppers is provided.

The Tropiduchidae of the Lesser Antilles (Homoptera: Fulgoroidea), R. G. FENNAH (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 6, pp. 137-167, illus. 77).—A taxonomic study, including much new nomenclature.

Note concerning *Solubea postposita* Bergroth, 1914 (Heteroptera: Pentatomidae), R. I. SAILER. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 5, p. 136).—A supplementary taxonomic note (E. S. R., 91, p. 712).

The status of *Corimelaena* White, 1839, *Eucoria* Mulsant and Rey, 1865, and *Allocoris* McAtee and Malloch, 1933 (Heteroptera: Pentatomidae), R. I. SAILER. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 5, pp. 129-135, illus. 3).—On the taxonomic status and synonymy of these genera of the stinkbug family.

On the status of *Liancalus limbatus* Van Duzee (Diptera-Dolichopodidae), F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 2, pp. 55-56).—A taxonomic note.

*Phlebotomus* (*Dampfomyia*) *anthophorus* n. sp. and *Phlebotomus diabolicus* Hall from Texas (Diptera: Psychodidae), C. J. ADDIS (*Jour. Parasitol.*, 31 (1945), No. 2, pp. 119-127, illus. 18).—The addition of *P. anthophorus* n. sp. makes a total of six known species of this sand fly genus, which has been taken throughout the Southern States from Maryland to California.

Undescribed species of *Tipula* from western North America (Diptera, Tipulidae), C. P. ALEXANDER. (Mass. State Col.). (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 2, pp. 33-37).—Two new species of *Tipula* are described.

The blood picture of the southern armyworm (*Prodenia eridania*), J. F. YEAGER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 1, pp. 1-40, illus. 14).—Blood cells or hemocytes present in all stages of the southern armyworm were studied and found to fall into 10 classes which could be divided into 32 types. These hemocyte types are described and their variants indicated. Some blood cells exhibited slight alterations at about the time of the molts and showed marked transformations during metamorphosis. The early larval phase of the life cycle is characterized by a predominance of transitional, primitive, and perhaps embryonic types of blood cells. In the late larval phase there is marked development of special larval hemocytes which reach maximum numbers and development at about the beginning of pupation and disappear during the pupal stage. The prepupal and pupal stages represent a transitional phase with a maximum percentage of some types of cells and the eventual disappearance of almost all the larval hemocytes and, apparently, the first appearance of the adult hemocytes. The adult phase is characterized by the development of adult hemocytes, most of which are plasmacytocytes. A ratio was used to indicate the tendency of cells to undergo passive-active rounding, and rounding took place particularly at the time of the molts, pupation, and emergence. These results indicate that chromophiles, spheroidocytes, eruptive cells, plasmacytocytes, and oenocytelike cells are derivable from the proleucocytes, and some are derivable from the chromophiles. Furthermore, it appears that vermiform cells, podocytes, and cystocytes can be derived from plasmacytocytes. The known functions of the various hemocytes of the southern armyworm are summarized as phagocytosis; participation in hemolymph coagulation; agglutination in vivo, including the formation of capsules; plastid formation; eruption or sudden liberation of material into the plasma under certain conditions; and glycogen storage. Results suggest that during the life of the insect some hemocytes perform special and others general functions. According to the author, it was possible with a success of 75 percent of the trials to identify the stages of development of the southern armyworm by inspection of its hemocytes in hemolymph smears.

Robber fly and Japanese beetle, S. W. BROMLEY (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 2, pp. 44-47).—Notes are presented on an insect enemy of the adult beetle in Connecticut, viz., a large robber fly—*Bombomima grossa* Fabr., one of the bumblebee mimics; records of other prey of this species, collected over a period of years, are also given.

*Ataenius darlingtoni* Hinton, a synonym of *A. salutator* Fall [Coleoptera, Scarabaeidae], O. L. CARTWRIGHT. (S. C. Expt. Sta.). (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 2, p. 47).

The generic position of certain Mexican Pompilidae (Hymenoptera), with description of a new genus, J. C. BRADLEY. (Cornell Univ.). (*Phila. Acad. Nat. Sci., Notulae Naturae*, No. 145 (1944), pp. 12).—The new genus is *Dicyrtomalis*, which "seems most closely related to *Ferrevooides* Haupt . . .".

On two holarctic pemphildine wasps (Hymenoptera, Sphecidae), V. S. L. PATE. (Cornell Univ.). (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 2, pp. 38-43).—A discussion and "startling array of synonyms" of two species of *Ectemnius*.

A taxonomic outline of the nearctic species of *Pachynematus* (Tenthredinidae; Hymenoptera), H. H. Ross. (Ill. Nat. Hist. Survey). (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 5, pp. 105-120, illus. 35).—Includes a key to species or groups of adults and new taxonomy in this genus of sawflies.

The wasp *Chlorion laeviventris* as a natural control of the Mormon cricket (Sphecidae; Hymenoptera: Tettigoniidae, Orthoptera), I. LA RIVERS. (Univ. Nev.). (*Amer. Midland Nat.*, 33 (1945), No. 3, pp. 743-763, illus. 8).—This wasp, "undoubtedly the most important parasite of the adult Mormon cricket," overcomes its prey by mounting the back and stinging between the legs, which always results in a temporary paralysis and sometimes in death. The victim is then dragged to a burrow where an egg is attached to the cricket's body just above the insertion of one of the hind legs; the cricket is then tamped in with dirt. Two crickets are usually placed in one burrow, but one and three are often found and very occasionally four, while five have been supposedly reported. Each burrow is completely recovered and topped with a characteristic pile of pebbles or sticks and bits of dirt. In the 1 × 0.5 mile area studied, more than 500,000 buried crickets were reliably estimated from 1,182 counting stations; at an estimated rate of 1.5 burrows per day dug by each wasp, the number active in the area can be tentatively placed at 30,000. The efficiency of control by this wasp is seriously counteracted by three wasp egg parasites and five major predators. Of the former, two sarcophagid flesh flies are the most significant, destroying an estimated total of nearly 30,000 wasp eggs and larvae, while the red-banded bembicid wasp is nearly as destructive. Among the predators, the Sierra shrew and the short-tailed grasshopper mouse are the most significant, accounting for 90 to 95 percent of the total adult wasp destruction, while three species of birds are also important. There is also the possibility that crickets may occasionally catch and eat adult wasps. Available evidence indicates that a period of 4 to 8 yr. or more may elapse between the time that the crickets indigenous to any one area break out in epidemic proportions and the time that the wasps themselves reach equilibrium with them. However, the beneficial wasp population may be reduced to insignificance in one season if the crickets on which they prey are suddenly reduced in numbers. There are 22 references.

The leaf-cutting ant problem in the Americas, E. J. HAMBLETON (U. S. Dept. Agr., Agr. in Americas, 5 (1945), No. 7, pp. 123-125, 135, illus. 4).—The leaf-cutting ant is one of the more destructive pests of tropical and subtropical America. The most economical and effective control is by means of poison gases, one of the best known materials being CS.

The effect of physical factors upon catch of the beet leafhopper (*Eutettix tenellus* (Bak.)) by a cylinder and two sweep-net methods, V. E. ROMNEY. (U. S. D. A.). (*Ecology*, 26 (1945), No. 2, pp. 135-147, illus. 4).—A cylinder method was developed and found satisfactory for detailed studies of insects on herbaceous plants; it is limited to sandy soils and hosts not over 12 in. high. The catch by this method was apparently not affected by physical factors, but with the

regular and brisk sweep methods their influence was significant. Temperature, as it was raised, appeared very important in increasing the sweep-net catch of both nymphs and adults, though it did not affect them alike; an increase in wind velocity, on the other hand, tended to decrease the catch. Physical factors proving of minor importance in the net methods were time of day between sunrise and sunset, relative humidity, nebulosity, host height at 6-12 in. with a net 14 in. in diameter, and host density at a soil coverage of 30 to 90 percent. The period of day after sunset until dark seemed to account for a significant increase in the catch by net. On the basis of adults and nymphs per square yard as indicated by the cylinder methods, the percentage of catch by the brisk-sweep methods for adults was 32-31.1 as compared with 0.5-16.3 percent for the nymphs. Changes in temperature and wind velocity were not responsible for all this variation, but the major part should probably be attributed to them. Data from somewhat normal weather conditions showed a high correlation between catches by the cylinder and those by the net methods. Catches from both sweep-net methods tended to exaggerate the ratio of adult ♂♂ to adult ♀♀ by about 10 to 12 percent. On the basis of 14 comparisons, the percentages of ♂♂ caught by the regular-sweep and brisk-sweep methods averaged  $11.97 \pm 1.8$  percent and  $10.74 \pm 1.8$  percent higher, respectively, than the percentages of ♂♂ caught by the cylinder method. There was a natural variation in beet leafhopper numbers from plant to plant according to the cylinder samples which should not be considered as sampling error. This plant-to-plant variation by cylinder sampling was as great as that between net samples in instances where the size of the areas was the same. This would seem to indicate that the sweep net will give a reliable sample—from the standpoint of variation—if the effects of temperature and wind velocity are corrected.

Resistance of dent corn inbred lines to survival of first-generation European corn borer larvae, L. H. PATCH and R. T. EVERLY (*U. S. Dept. Agr., Tech. Bul. 893 (1945)*, pp. 10, illus. 1).—A graphic method is discussed for rating strains of dent corn for resistance, partial resistance, or susceptibility to the survival of first-generation larvae of the European corn borer by use of the mean data from groups of standard strains as measures for comparison. Based on a scale from 0 to 10, the average rating of numerous inbred lines tested from 1938 through 1941 as inbreds or in hybrid combination is given, and in 37 instances, the strains were tested both as inbreds and as hybrids. The following lines were most resistant: Ind. P8, Kan. K230, Ia. L304A, and Mich. 285 in hybrid combination and lines Kan. K230, Kan. K226, Mich. 285, and Ill. 408 in tests of lines as such. Partial resistance was shown by the following: Lines Ind. 38-11, Ia. Os420, Kan. K228, and Ohio 40B in hybrid combination and lines Ohio O7, Mich. 898, Mich. 393, and Minn. A342 in tests of lines as such; and the following lines were most susceptible: Ia. BL351 and Neb. BR1756 in hybrid combination and lines Ind. PS7852, Ind. 33-16, Wis. 4412, and Ill. 5675 in tests of lines as such. When plants of inbreds of previously established resistance and susceptibility were compared with their single-cross hybrids in adjacent hills and infested by hand with about 120 eggs per plant, the numbers of larvae in inbred parents and their hybrids were approximately as follows: Resistant  $\times$  resistant, 2.71 and 0.70; resistant  $\times$  partially resistant, 3.20 and 1.27; resistant  $\times$  susceptible, 3.69 and 1.83; partially resistant  $\times$  susceptible, 4.18 and 2.40; and susceptible  $\times$  susceptible, 4.67 and 2.96. In this study the hybrids average almost a constant difference of 1.86 fewer borers per plant than the inbreds used to produce them, even though the hybrids averaged 7.1 days earlier in silking than their inbreds. During 3 yr., six widely planted Corn Belt hybrids were compared with some of the most borer-susceptible and resistant experimental hybrids, and the group of commercial hybrids showed about half as borer-resistant as the resistant group.

The development of the eggs of *Rhizopertha dominica* Fab. (Coleoptera) at constant temperatures, L. C. BIRCH and J. G. SNOWBALL (*Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 1, pp. 37-40, illus. 1).—The developmental time for eggs of the lesser grain borer was obtained for eight temperatures at two moisture levels. The product saturation deficit  $\times$  developmental time was kept constant for all temperatures; this proved the best index for maintaining constant moisture conditions over a temperature range. The index was not fully independent of temperature, as shown by the interaction between temperature and the product saturation deficit  $\times$  time; this interaction, however, was small. The eggs developed fastest at 36° C. The mean reciprocals for the time to complete development, plotted against temperature, were fitted to logistic curves.

Interesting problems connected with the checkered white butterfly *Pieris protodice*, Boisduval and Leconte, G. W. RAWSON (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 2, pp. 49-54).—The southern cabbageworm is both sexually and seasonably dimorphic. It is reputed to be less common than formerly, one of the reasons being based on the assumption that the imported cabbageworm has interfered with it, though the author believes parasitism to be one of the most likely explanations. Like many other butterflies *P. protodice* fluctuates in abundance from season to season. A theory is presented to explain the survival of the species when at a low ebb, possibly by the influx of migrants into depleted territory. A late form is described that resembles the western form or race and the relationships of these forms to survival are discussed.

Pea aphids may be high! H. F. WILSON. (*Univ. Wis.*). (*Food Packer*, 26 (1945), No. 6, pp. 55-57, illus. 2).—Recommended control materials and practices for 1945, based on the latest experimental data.

Control of red spider mites, A. C. SIMPSON (*Nature [London]*, 155 (1945), No. 3930, p. 241).—Recent field tests are reported to have established that control of *Tetranychus telarius* can be obtained on hops and on greenhouse tomatoes in Great Britain by use of 2 : 4 dinitro-6-cyclohexylphenol; a wetting agent was necessary on tomatoes.

Interest revived in dusting for codling moth, S. W. HARMAN. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 3, pp. 10, 12-13).—A practical account.

Experiments with DDT for codling moth control at the Vincennes, Ind., laboratory, L. F. STEINER, S. A. SUMMERLAND, and J. E. FAHEY. (U. S. D. A.). (*Ind. Hort. Soc. Trans.*, 1944, pp. 26-38).—DDT was tested extensively against the codling moth in Indiana during 1943-44. In a large-scale test, sprays at 1 lb. to 100 gal. proved more effective than the standard nicotine-bentonite program (1 pt. nicotine sulfate—40 percent nicotine—to 100 gal.), and in small-plot field tests, DDT at the same strength gave much better control than the standard lead arsenate program (4 and 3 lb. to 100 gal.). DDT is a very effective supplement when added in small amounts to lead arsenate or nicotine-bentonite and can be used in split schedules of or following sprays of lead arsenate or nicotine-bentonite; it can also be employed effectively with summer oils or bordeaux. Owing to variations in the physical properties of different lots of DDT received for testing, the results have varied considerably; much remains to be done in developing formulations most suitable for codling moth sprays. At certain dosages within the range required for codling moth, DDT is very toxic to important predators of the European red mite and the common red spider; under favorable weather conditions on DDT-sprayed plots the mite populations built up to extremely destructive levels in record-breaking time. DDT is very effective against leaf-hoppers and has shown promise in controlling several species of apple aphids. It is believed, however, that much more work must be done before general adoption of DDT by growers will be desirable.

Some ecological studies on the parasites of the oriental fruit moth (*Grapholita molesta* (Busck) in Ohio, N. D. BLACKBURN (*Ohio State Univ., Abs. Doctoral Diss.*, No. 44 (1944), pp. 141-146).—An abstract of the results of a 5-yr. study of the ecology, distribution, and propagation of the parasites of the oriental fruit moth in Ohio, with special reference to the comparative effectiveness of *Macrocentrus ancyllivorus* Roh.

The apple redbug as a pest in Hudson Valley orchards, R. W. DEAN. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 3, pp. 5-6, illus. 3).—A practical account.

Handbook of pest control: The behavior, life history, and control of household pests, A. MALLIS ([New York]: MacNair-Dorland Co., 1945, pp. 566, illus. 139).—Although this handbook is concerned primarily with insects and arachnids as household pests, there are also included such widely diverse trouble makers as dry rot fungi, rats and mice, and such miscellaneous pests as sow bugs and pill bugs, amphipods, snails, millipedes, scorpions, centipedes, bats, skunks, and birds. Sections also deal with chemicals used in controlling household pests, household fumigation, and elementary facts concerning insects and other arthropods. A classified 41-page bibliography and a subject index complete the volume.

Tyroglyphid mites in stored products: Methods for the study of population density, M. E. SOLOMON (*Ann. Appl. Biol.*, 32 (1945), No. 1, pp. 71-75, illus. 1).—The known methods for detecting the presence of these mites are described. For coarse materials, such as seeds, sieving is recommended. For flour it is better to examine exposed surfaces or to keep samples in glass vessels and examine for tunnels made against the glass. Methods of sampling to provide information on the density and extent of infestations are described. Samples must usually be treated in the laboratory. Though methods not involving separation of the mites from the material are referred to, such separation is usually necessary. Mites may be separated from most materials by the modified Berlese funnel method of Chernuichev and Petrova; means of overcoming certain disadvantages are suggested. Vigorous sieving is recommended, however, for coarse materials, and a flotation method using dichloroethylene for fine materials such as flour. It is usually more satisfactory to examine and count the mites than to estimate the numbers volumetrically or gravimetrically; they are counted in a dish containing oil placed on squared paper under a low-power microscope. A modification of this method—for dealing with large numbers—is described. Methods of expressing population density are discussed briefly.

Anopheles-Beobachtungen in Griechenland [Anopheles observations in Greece], W. EICHLER (*Arch. Schiffs u. Tropen Hyg.*, 48 (1944), No. 11-12, pp. 261-272, illus. 9).

A list of the mosquitoes of the District of Columbia, N. E. Goon (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 6, pp. 168-179).—An annotated list, with introductory discussion and review.

New Jersey light-trap versus human bait as a mosquito sampler, R. M. STABLER (*Ent. News*, 56 (1945), No. 4, pp. 93-99).—For 45 nights the author exposed himself to mosquito bites for 30 min., beginning at dusk. A New Jersey light trap (25-w. white frosted lamp) was also operated during the baiting period and throughout the night; the sites were 82 ft apart. A total of 1,571 ♀ mosquitoes was caught, 70.3 percent being attracted to the bait and 29.7 to the trap. *Culex* spp. preferred the bait (73.6 percent) to the trap; *Aedes vexans* was about equally attracted; of 74 *Anopheles punctipennis*, 27 went to the light and 47 bit; of 62 *Aedes cantator* taken, 60 were caught feeding. Several other species were taken in numbers too small for comparison. For sheer numbers, the particular bait individual used proved a much better attractant than the 25-w. lamp.

Species of *Lucilia* attacking sheep in South Africa, G. C. ULLYETT (*Nature [London]*, 155 (1945), No. 3943, pp. 636-637).—Two blowflies of this genus—*L. cuprina* and *L. sericata*—are said to be associated.

A method for permanently reducing the number of blowflies in screened houses, E. H. STRICKLAND (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 2, pp. 59-60).—The geotactic tendency of blowflies (Calliphoridae) when walking leads them to walk up a screen, even though they will fly in any direction. The combined effect of their various responses is that all of them will eventually be brought to the upper edge of the screen. It was found that if a pencil be pushed through the meshes at one of the top corners of the screen every blowfly in the room will sooner or later be directed to it and walk out, provided the window is partly open above or below and the daylight is not dimmed by awnings.

The Argasidae of North America, Central America, and Cuba, R. A. COOLEY and G. M. KOHLS (*Notre Dame, Ind.: Univ. Press*, 1944, pp. 152+, illus. 71).—This monograph (American Midland Naturalist Monog. Ser. No. 1) on the tick family Argasidae considers the medical and veterinary importance of the group and describes its principal characters and the methods of study used. Keys for identifying the genera and species of *Argas*, *Ornithodoros*, *Antricolo*, and *Otobius* are provided. A classified list of hosts, a listing of the geographical distribution of species by countries, a five-page bibliography, and an index complete the work.

Powder-post beetles and their control and notes on chlorinated phenols as soil poisons for termite control, M. B. CHRISTIAN (*Pests*, 13 (1945), No. 6, p. 20).—Results of tests with chlorinated phenols are reported as promising.

Studies on the bacteroids of *Cryptocercus punctulatus*, S. C. HOOVER (*Jour. Morphol.*, 76 (1945), No. 3, pp. 213-225, illus. 5).—The morphology and staining reactions of the intracellular organisms of *C. punctulatus*—a wood-eating roach of the Appalachian Mountains and the west coast—seem to preclude their being mitochondria and to ally them with the Corynebacteriaceae. Their culture on artificial media argues against their being true Rickettsias, but the difficulty with which they are cultivated suggests that they should be called bacteroids rather than bacteria. Sustained bacteroid growth occurred in 65 percent of the original inoculations. These bacteroids occur in modified cells of the fat body known as mycetocytes; the number of mycetocytes was directly influenced by subjecting the roach to inanition. In the ovary, bacteroids appear around the yolk of young oocytes and, keeping pace with the developing egg, form an 8μ-layer around the yolk in nearly mature oocytes; inanition failed to cause bacteroids in the ovary to increase. Though mycetocytes are located against the ovariole wall and surround the testes, bacteroids were never found in the testes. There are 19 references.

An annotated list of the Scolytoidea of Washington, G. K. PATTERSON and M. H. Hatch (*Wash. Univ. [Scatife] Publs., Biol.*, 10 (1945), No. 4, pp. 145-156).—This paper consists of an annotated list of 98 species of bark beetles from Washington State.

The toxicity and penetrative capacity of certain pentachlorophenol wood preservative solutions, P. M. D. KROGH and F. G. C. TOOKE (*Jour. So. African Forestry Assoc.*, No. 12 (1944), pp. 52-59).—An account is given of the development of pentachlorophenol-based wood preservatives in which toxin, solvents, and penetrants, in mutual equilibrium, each retains sufficient of its peculiar characteristics to insure, by momentary immersion, a clean, dry, safe, economical, and certain protection against wood-destroying insects and fungi.

How to make wood unpalatable to the West Indian dry-wood termite, *Cryptotermes brevis* Walker, III, G. N. WOLCOTT. (P. R. Univ. Expt. Sta.). (*U. S. Dept. Agr., Forest Serv., Caribbean Forester*, 6 (1945), No. 4, pp. 245-266; *Span. trans.*, pp. 256-265; *Fr. abs.*, pp. 265-266).—A continuation of the series

(E. S. R., 92, p. 91) discussing various chemicals tested against the West Indian dry-wood termite.

**Phenol as a termite repellent**, G. N. Wolcorr. (P. R. Univ. Expt. Sta.). (*Science*, 101 (1945), No. 2626, p. 444).—In comparison with other coal tar constituents, phenol appeared to be one of the least promising materials except on the basis of initial cost for use against the West Indian dry-wood termite *Cryptotermes brevis* (Walker). Initial toxicity appeared to be of little importance as compared with permanence in remaining repellent, in which fluorine, phenanthrene, fluoranthene, and pyrene proved greatly superior. The maximum effectiveness for this particular purpose would presumably be obtained by a combination of some of these organic compounds with the repellent metals.

**The study of wood borers in China.—I, Biology and control of the citrus-root-cerambycid, Melanauster chinensis Forster (Coleoptera)**, K. O. V. LIEU (*Fla. Ent.*, 27 (1945), No. 4, pp. 61-101, illus. 4).—This borer attacks citrus trees in both adult and larval stages, eating the leaves and petioles and the bark of twigs and branches as well as of the trunks if the trees are very young. Immediately after hatching, the larva feeds for about 2 mo. in the green sappy part of the inner bark at basal portions of the trunk; when about 16 to 20 mm. long it begins to bore into the wood, seriously mining the trunk, root, and rootlets. One larva is able to kill a tree up to an age of about 5 to 6 yr. The pest has one generation a year. Adults appear from late May to early August, but are most abundant during June-July. They mate soon after emergence and the preoviposition period may last 7 to 14 days. The ♀♀ cut slits on the bark of the trunk close to the ground and deposit eggs therein; these hatch in 7 to 21 days. The egg, larval, pupal, and preadult stages within the tree require around 12 mo.; the adult lives in the open for about a month. One ♀ may deposit 10 eggs, more or less. The larva grooves under the bark for about 2 mo.; this is the most important weak point in its life cycle. Ants attacking in the egg stage are the only known enemies. Methods of control include killing the adults, crushing the eggs and larvae under the bark, and whitewashing the basal parts of the trunks. Its known hosts include willow and apple trees as well as all species of citrus.

**The surplus male: A problem of biological control**, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 30 (1945), No. 9, pp. 267-268, 275).—"The female of the species carries the burden in the biological control of insect pests of citrus even as she carries the burden of milk production in the dairy, egg production on the chicken ranch, and honey production in the apiary." The beekeeper and producer of parasites against citrus pests have the advantage, however, since they can by proper manipulation of the breeding stock cause ♀♀ to appear in the place of ♂♂. The present status of knowledge on the subject is reviewed, with illustrative examples.

**Starting right with bees or beginner's hand book on bees**, H. G. ROWE (*Medina, Ohio: A. I. Root Co.*, 1945, 7. ed., pp. 104, about 200 illus.).—This edition was largely rewritten with supplementary chapters by E. R. Root and several chapters by M. J. Deyell.

**The spring crisis in New York State beekeeping**, E. F. PHILLIPS (*Amer. Bee Jour.*, 85 (1945), No. 7, pp. 233-234, 236-237).—The unseasonably hot weather of March 1945 gave colonies an exceptional start in brood rearing; this hot weather in the State lasted long enough so that adult populations were increased and colonies became so strong that when cooler weather arrived colony strength continued to increase almost unchecked. With the later cool weather and frost, gathering of normally available spring nectar supplies from fruit bloom and other sources was impeded. This situation is said to have resulted in honey stores of the better colonies being exhausted by June 1 or before, and by that date alert beekeepers

were feeding and few colonies stood a chance of survival without prompt attention. "If New York State gets a clover honey crop this year, it will be due to the alertness of beekeepers."

**Acoustic observation in winter, II.** A. E. SUTHERLAND (*Bee World*, 26 (1945), No. 6, p. 44).—Continuing the observations previously reported (E. S. R., 92, p. 686), the reactions of a hive of bees seemed to be that as the mercury receded the sound declined until it reached its lowest level, but after a period of time it was raised and maintained at a slightly higher level. When the temperature continued to lower or fell sharply, the bees responded until the sound again reached—as far as could be judged—the same low level, again to be raised and maintained, and so on. Thus there appears to be a definite low level which may be reached several times during a cold spell, but each time it is suitably rectified by the bees within the interior of the cluster raising the temperature and thereby the sound of the increased respiration.

**Can we depend on pollen substitutes?** M. H. HAYDAK. (Minn. Expt. Sta.). (*Amer. Bee Jour.*, 85 (1945), No. 4, pp. 119, 123).—Soybean flour mixed with dried brewer's yeast at 9 to 1 or 6 to 1 was found a very effective pollen substitute. Cakes for feeding are made by mixing 1 lb. of dry pollen substitute with 1 qt. of 2 to 1 sugar-water solution.

**Bee training for pollination of cucumbers,** A. F. GUBIN (*Bee World*, 26 (1945), No. 5, pp. 34-35).—In low-nectar plants the use of directionalized pollination under glass is reported to be as effective as for field conditions. In cultivation of cucumbers under glass one of the principal features is the method of artificially inciting the bees to fly from the hives by feeding them in the hive with sirup carrying the odor of cucumber blossoms. Successful experiments are described.

**A new bee repellent for poison dusts and sprays,** A. G. HILDRETH (*Amer. Bee Jour.*, 85 (1945), No. 6, p. 198).—On the basis of experimental tests, synthetic powdered camphor is recommended as a bee repellent for use with insecticidal dusts.

**Sulphonamides and American foul brood disease of bees,** P. S. MILNE (*Nature [London]*, 155 (1945), No. 3933, p. 335).—Promising experimental results with sulfaipyridine are believed to justify future tests on a larger scale.

**A review of the North American species of Philanthus north of Mexico (Hymenoptera: Sphecidae),** R. W. STRANDTMANN (*Ohio State Univ., Abs. Doctoral Diss.*, No. 46 (1945), pp. 151-155).—A taxonomic study of this genus of brightly-colored fossorial wasps of cosmopolitan distribution which kill and store bees for their larvae.

## ANIMAL PRODUCTION

**The manufacture and storage of cereal feeding-stuffs with incorporated non-protein nitrogen compounds,** D. SNOW, J. A. B. SMITH, and N. C. WRIGHT (*Jour. Agr. Sci. [England]*, 35 (1945), No. 2, pp. 65-71, illus. 4).—The loss of incorporated nonprotein nitrogen from cubes stored at different temperatures and humidity for periods extending up to 300 days was small. The loss of urea was very small provided molding did not occur. That of ammonium bicarbonate was large, amounting to about 50 to 60 percent. The size of the cubes and the nature of the container are discussed with reference to nitrogen losses.

**Feeding cottonseed products to livestock,** N. R. ELLIS and R. E. HODGSON (*U. S. Dept. Agr., Farmers' Bul. 1179, rev.* (1945), pp. 13+, illus. 4).—In this revision (E. S. R., 44, p. 867), it is emphasized that with carbohydrate feeds it is important to use a high source of protein such as cottonseed meal. The merits of other cottonseed products are pointed out, especially as they may be used by beef stock, dairy cows, young calves, bulls and heifers, hogs, horses, sheep, and poultry, and in pasture feeding.

Partial amino-acid compositions of the proteins of some legume seeds: The tyrosine, tryptophane, cystine (plus cysteine) and methionine contents, J. W. H. LUGG and G. J. CLOWES (*Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 1, pp. 75-79).—The seeds and whole proteins of *Trifolium subterraneum* were found to be very low in methionine content and with moderate amounts of cystine (plus cysteine). The whole proteins of ripe seeds of *T. subterraneum* and of embryos of ripe seeds of *Lupinus luteus* were of moderate tyrosine content and rather low tryptophane content. These results and other studies indicate that the tryptophane content of the whole protein of legumes may be low.

Vitamin supplements for low grade alfalfa meal, L. F. PAYNE, M. J. CALDWELL, and J. S. HUGHES. (Kans. State Col.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 375-377).—Comparison was made of a representative sample of dehydrated alfalfa meal (17 percent protein) and a low-grade sun-cured second-cutting alfalfa hay, as well as a substitute for alfalfa for chicks made from bagasse, soybean meal, and vitamin A and G concentrates. These ingredients were compared in 4 lots of 100 New Hampshire chicks each. One lot received the standard ration used for chickens of all ages for a number of years. A second lot received the same ration with vitamin G per pound increased from 1,295 to 1,800 units. The third lot received 10 percent sun-cured alfalfa meal instead of an equal amount of dehydrated meal and both vitamin A and G increased to the level used in the previous lots. From the weights and mortality at 4 and 8 weeks of age, it is concluded that the principal value of dehydrated alfalfa used was its vitamin A and G contents. Unknown amounts of liver were present in the substitute, which may have been responsible for some of the beneficial effects.

Vitamin D for four-footed animals, F. B. MORRISON. (Cornell Univ.). (*Grain and Feed Jours. Cons.*, 94 (1945), No. 4, p. 157).

Cow is vitamin B factory (*Pennsylvania Sta. Bul.* 464, Sup. 2 [1945], p. 3).—Concerning the results previously reported by Bechdel et al. (E. S. R., 58, p. 363) on the manufacture of the vitamin B complex in the rumen, it is stated that scientists and feed manufacturers are concerned with the problem of how to include the B vitamins eliminated in cow manure in feeds for other forms of livestock.

Nutritional deficiency diseases, their sources and effects, W. B. DAVIDSON (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 6, pp. 155-162, illus. 8).—The effects of several nutritional deficiencies are noted, such as phosphorus deficiency or the improper balance of calcium and phosphorus. Notation is made of the toxic effects of selenium. There may be faulty phosphorus metabolism with heavy infestation of certain roundworms. Urinary calculi may be a serious problem of cattle and sheep, both on the range and in the feed lot.

Effect of feeding protein supplement on growth of pigs and on profits, F. B. HEADLEY. (Coop. U. S. D. A.). (*Farm Mangt. Bul.* [Nevada Sta.], 6 (1945), No. 1, pp. 5+, illus. 1).—Benefits in gains and profits were produced in dry-lot feeding by additions of protein supplements, but were not so good on alfalfa pasture.

Barley vs. wheat as the basal feed in the bacon hog ration, E. W. CRAMPTON and G. C. ASHTON (*Sci. Agr.*, 25 (1945), No. 7, pp. 403-414, illus. 4).—Two experiments were conducted with a total of 120 Yorkshire pigs averaging 44 lb. each in live weight. Ten groups in each experiment were fed to market weight on rations consisting of 0, 25, 50, 75, or 100 percent barley and the balance wheat. Some groups received one or the other of these grains to 100 or 150 lb. live weight, with the grain reversed thereafter. A protein-mineral mixture was given as 15 percent until about 110 lb. live weight was reached, after which this mixture was reduced to 10 percent. Wheat tended to cause more rapid live weight gains than barley, and the carcasses of the pigs marketed at 200 lb. live weight were

fatter. This condition was noted as well in the carcasses of pigs receiving rations containing over 50 percent of wheat. Male pigs seemed more subject to carcass damage from heavy wheat feeding than females, presumably because of the more rapid maturity of males. The leanness of the bacon was correlated with the rate of gain to 200 lb. Restricting the total digestible nutrients during fattening is suggested.

The calcium requirement of growing foxes, L. E. HARRIS, C. F. BASSETT, S. E. SMITH, and E. D. YEOMAN. (Cornell Univ. et al.). (*Cornell Vet.*, 35 (1945), No. 1, pp. 9-22, illus. 6).—The requirement of foxes for calcium was ascertained in 6 lots of 10 ♂ and 8 ♀ foxes each. The basal ration included 0.52 percent phosphorus, 1.29 percent cod-liver oil containing 400 chick units of vitamin D per gram, and varying amounts of calcium as follows: 0.16, 0.20, 0.30, 0.41, 0.51, and 0.51 percent. The first five of these lots were enclosed in furring sheds, but the sixth lot was exposed to sunlight. Symptoms of calcium deficiency, such as lameness, recurrent spasms, crooked legs, edematous swelling of the muzzle, and enlarged cranial bones, were observed on the low-calcium rations. All of the foxes receiving 0.51 percent calcium were normal at the end of the experiment of 45 to 57 days. Feed consumption and gains in weight were positively correlated with the amounts of calcium fed. At pelting time, the humeri of the foxes receiving 0.41 percent calcium were as adequate for ash, calcium, and specific gravity as those fed 0.51 percent calcium. However, 67 percent of the foxes receiving 0.41 percent calcium showed marked calcium deficiencies during the period of most rapid growth and 35 percent had crooked legs. All of these considerations were taken to indicate that the calcium required in the dry ration is no less than 0.51 percent. The pelts of the foxes in the shade were superior to those housed in the sunlight in the length of hair and clarity of the silver band and guard hair.

Battery and floor management practices for pullets and hens, W. T. COONEY, C. E. HOLMES, J. A. HARPER, and H. E. COSBY. (Oreg. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 310-313).—In battery and floor management for pullets, using pelleted and unpelleted mashes, no significant differences were noted with respect to egg production and mortality. Battery-held pullets consumed larger quantities of mash or pellets and less scratch than did floor-fed pullets. In each group, about 50 birds were fed from September 1, 1940, to July 31, 1941, under the conditions of these experiments, and other groups were fed from August 1, 1941, to June 30, 1942. The pellet-fed battery pullets weighed more than mash-fed battery or floor pullets at the end of each test period. The hens maintained in floor pens for 2 yr. laid better than those released from batteries to floor pens, hens moved from floor pens to batteries, or those kept the second consecutive laying year in cages.

The family poultry flock, C. S. PLATT and L. M. BLACK (*New Jersey Sta. Cir.* 494 (1945), pp. 8, illus. 3).—General principles of poultry feeding and management, sanitation, and housing as applied to a small flock of pullets.

Effective use of proteins in the nutrition of the chick, H. J. ALMQVIST. (Univ. Calif.). (*Amer. Assoc. Cereal Chem. Trans.*, 3 (1945), No. 3, pp. 158-168, illus. 10).—Various feeds have been combined to furnish the amino acids needed by chicks, as noted by Kratzer (E. S. R., 93, p. 484), so that essential acids may be supplied from different sources.

Effect of heating, under various conditions, and of sprouting on the nutritive value of soybean oil meals and soybeans, J. P. MATTINGLY and H. R. BIRD. (Md. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 344-352).—In continuing studies of the favorable effects of additions of *dl*-methionine to a diet containing soybean meal (E. S. R., 92, p. 825), groups of 30 day-old New Hampshire chicks were fed on practical mashes with additions of 30 and 25 parts of soybean meal which

had been dried or autoclaved to contain 0, 2, or 5 percent water. The results showed that drying soybean meal prior to autoclaving to as low as 2 percent moisture did not influence the effect of autoclaving on the nutritive value of the meal, but drying the soybean meal to a constant weight at 105° C interfered with the beneficial effect of subsequent autoclaving on the nutritive value. The effectiveness of heat treatment on the soybean meal was not influenced by variations in the pH between 4.88 and 6.48. Soybean oil was also added, which showed that the presence or absence of the oil did not influence the effectiveness of heat treatment of soybeans or soybean meal. Sprouted soybeans fed to chicks as the major source of protein in a practical ration did not better the growth appreciably, but sprouted soybeans as the sole source of protein supported growth in rats better than unsprouted soybeans.

**Toxicity of vetch seed for chickens,** A. A. HORVATH (*Poultry Sci.*, 24 (1945), No. 4, pp. 291-295).—Two groups of mature Barred Plymouth Rock hens were fed for 35 and 20 days, respectively, on rations solely of untreated whole seed of the chickling vetch (*Lathyrus sativus*) and the vetchling (*L. cicerina*), with blood analysis for glucose, nonprotein nitrogen, uric acid, creatinine, cholesterol, inorganic phosphorus, and albumin and globulin. The results showed that *L. sativus* caused a substantial gain in weight and increase in blood protein. *L. cicerina* fed as the sole feed seemed to be toxic and caused loss in weight, but no pathological symptoms were noted on autopsy. There was indication that the pyrimidine base "divicine" is mainly responsible for the toxicity. Evidently the hens' organism is capable of converting divicine into creatinine. A theory is advanced that in the laying hen divicine may be safely stored in yolks as nucleins, to be liberated again on incubation by the enzyme pyrimidine-nucleosidase of the bone marrow, resulting in a toxic effect.

**Calcification in the poult,** J. C. FRITZ, J. H. HOOPER, and H. P. MOORE (*Poultry Sci.*, 24 (1945), No. 4, pp. 324-328).—Study was undertaken to determine the effect of levels and ratio of Ca and P upon calcification in the poult and the influence of vitamin D from different sources. Minerals had a marked influence on calcification and growth. The Ca and P requirements for optimum calcification with low vitamin D intake are relatively high, and a wide ratio seems to give optimum results. Some of the ratios which gave superior results with pouls were so wide that they would have been expected to increase the vitamin D requirement of chicks, according to several investigators. At suboptimal levels, growth varied with the vitamin D intake. Tuna livers, and at times reference cod-liver oil, had a growth-promoting value not possessed by vitamin D<sub>3</sub> or D-activated animal sterol. Vitamin A levels were more than adequate, and the additional growth can scarcely be attributed to the vitamin A in the fish sources. Reference cod-liver oil was peculiarly ineffective in rations low in Ca and P. D<sub>3</sub> and Delsterol seemed most effective, followed closely by tuna livers. Satisfactory calcification was obtained with ample Ca and P in the ration when nominal levels of any of the B supplements were employed. Differences in calcification with suboptimal amounts of minerals may be due to the fat content of the rations. The study involved comparison of bone ash, weight gains to 3 and 6 weeks, tibia ash, toe ash at 3 weeks with different amounts of Ca and P, and supplements of reference cod-liver oil, D<sub>3</sub>, dihydrotachysterol, and D-activated animal sterol. The studies were conducted with 7 to 12 pouls per lot.

The value of certain supplements in practical chick rations containing adequate riboflavin, W. W. CRAVENS, W. H. MCGIBBON, and J. G. HALPIN. (Wis. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 305-309).—A ration composed of yellow corn, wheat byproducts, meat scrap, soybean meal, minerals, fish oil, and riboflavin was found unsatisfactory for growing chicks. Growth was not improved with 5 percent sun-cured alfalfa leaf meal, but addition of 5 percent dry skim milk

resulted in some improvement. Variable and inconclusive results were produced by the inclusion of 2 percent solubilized liver. Additions of condensed fish press water or ground fish viscera were highly effective as supplements to the basal ration. The most satisfactory results were obtained in additions of dried skim milk and fish press water. The significance of these findings is briefly discussed.

**A note on the value of stickwater meal as a riboflavin supplement in poultry rations,** J. M. PRATT and J. BIERLY (*Poultry Sci.*, 24 (1945), No. 4, pp. 377-379).—Stickwater meal, when added at the 10-percent level to a basal ration consisting mainly of soybean meal, produced chicks at 5 weeks at average weights of 356 gm. as contrasted to only slightly better results estimated from the use of these amounts of salmon meal. The fact that there were no symptoms of ariboflavinosis, together with other results of the experiments in which comparisons were made of 5 and 10 percent stickwater meal with 7.5 and 15 percent herring meal or salmon meal or addition of 100 $\gamma$ , 200 $\gamma$ , and 300 $\gamma$  of riboflavin as supplements to the basal ration, suggested that the dried stickwater could be used to a considerable extent as the source of riboflavin.

**The comparative requirements of chicks and turkey poult for pantothenic acid,** S. LEPKOVSKY, F. H. BIRD, F. H. KRATZER, and V. S. ASMUNDSON. (Univ. Calif.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 335-339).—Two series of experiments were conducted in comparing the pantothenic acid requirements of chicks and poult, and the authors explain differences found by other workers, including Jukes and McElroy (E. S. R., 90, p. 515). In the first experiment, maximum gains in weight with both chicks and poult, using the heated ration, were made at the level of 5.1 mg. of added pantothenic acid per kilogram of body weight. The heated ration contained about 1 mg. of pantothenic acid. This indicates that the pantothenic acid requirement of both chicks and poult was 6.1 mg. Growth was not normal with either of these species, which indicates that certain of the other essentials were destroyed by the heat treatment. This was especially so with the poult, as they grew more slowly than the chicks. Results with extracted diets in this and in a subsequent experiment indicated that the turkey poult required more pantothenic acid per kilogram than chicks and normally made more rapid growth. These studies were conducted with about 10 chicks or poult per lot, with supplements of 0, 2.6, 5.1, 7.1, and 10.2 mg. per lot in the first and second experiments.

**Activity of pyridoxine derivatives in chick nutrition,** T. D. LUCKEY, G. M. BRIGGS, JR., C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 1, pp. 340-344).—Studies similar to those previously reported by Snell et al. (E. S. R., 88 p. 712) on the effects of pseudo-pyridoxine on the rat were reported for chicks, using similar methods. White Leghorn chicks were fed basal rations for 3 days and then divided into uniform groups of 4 to 6 each and fed ad libitum. The basal ration was appropriately supplemented with the pantothenic acid derivatives. A group of 12 lots of chicks received the basal rations, portions of which were supplemented with pantothenic acid-similar products. The weights at 4 weeks of age were noted, and blood samples for prothrombin estimation were drawn from a few of the chicks at 2, 3, and 4 weeks of age. The addition of pyridoxal (2-methyl-3-hydroxy-4-formyl-5-hydroxymethylpyridine) and pyridoxamine (2-methyl-3-hydroxy-4-aminomethyl-5-hydroxymethylpyridine) or pyracin-5 to the vitamin B<sub>10</sub>- and B<sub>1</sub>-deficient rations was investigated, but these had no effect on growth or feathering. Pyridoxine was also inactive when fed with a mixture of xanthopterin, thymine, and guanine. The vitamin B<sub>6</sub> activity of pyridoxal, pyridoxamine, and pyracin-5 was approximately 1/2, 4%, and 0, respectively. The symptoms of B<sub>6</sub> deficiency in the chick were a decreased clotting time of the blood, hyperprothrombinemia, small spleens, and anemia.

**Studies on the chick assay for vitamin D, III, IV,** J. A. CAMPBELL and A. R. G. EMSLIE (*Poultry Sci.*, 24 (1945), No. 4, pp. 296-300, 301-304, illus. 2).—In continuing this series (E. S. R., 92, p. 826), two additional papers are presented:

**III. The variability of chicks and the estimation of error from replicated group data.**—Over 30 oils were analyzed for variance on chicks used for vitamin D determinations, including standard and unknown oils. Four criteria of calcification were used in the study, namely, tibia ash, extracted toe ash, and 2- and 3-week radiographs. Fiducial limits as calculated from the variance for replicates and the variance for error were compared. The variance for replicates was greater under the conditions of the experiment than for error, but on the basis of the average individual assay the ratio was not significantly different. Also, the fiducial limits calculated from replicate data were slightly wider than those calculated from error. Thus, the routine use of variance between replicates as an estimate of error would be of unquestionable advantage, but, at least for the tests conducted at this laboratory, the time and labor involved would be saved and would make this method preferable.

**IV. The reproducibility of five criteria of calcification.**—The potency of vitamin D supplements for chicks was calculated for three or four groups at three dosage levels. When the groups were partitioned into standard and unknown it was possible to obtain a measure of precision, and the accuracy of five criteria of calcification in a series of assays was ascertained. Conclusions previously reached were substantiated. There was no difference in reproducibility or accuracy between radiographic method, toe ash, or tibia ash in 3-week-old chicks. Similar results were also obtained in 2-week-old birds. "Analysis of variance of the results shows that in this laboratory there is somewhat more variability between different assays than between the five methods studied."

**Avitaminosis "A" in poultry,** W. B. DURRELL (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 6, pp. 163-165, illus. 1).—Avitaminosis A in poultry is manifested by chicks at 3 to 4 weeks of age by the cessation of growth, drowsiness, weakness, staggers gait, emaciation, and ruffling of feathers. The shanks and beaks show lack of yellow pigment, and combs and wattles become pale. Occasionally symptoms of lachrymation, presence of cheesylike material under the eyelids, and xerophthalmia are evident. With adult birds there is unthriftiness and decrease in egg production and hatchability. Small, white, pustulelike lesions on the mucous membranes may be observed after death. Birds respond rapidly to vitamin A treatment if the deficiency is not too far advanced. Optimum levels of vitamin A for chickens of different ages and for turkeys are presented.

**The transfer of carotinoid pigments to the egg yolk,** B. B. BOHREN, C. R. THOMPSON, and C. W. CARRICK. (Ind. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 356-362, illus. 2).—Groups of Buff Orpington (normally white skinned) and Rhode Island Red (normally yellow skinned) chicks were raised on low-carotinoid and highly pigmented rations. When egg production began, 12 pullets from each breed raised on the high- and low-pigment rations were placed in individual laying cages and given an extremely low-carotinoid ration designed to deplete them for vitamin A and carotinoids. This ration included charcoal with the hope of adsorbing any carotinoid pigment that might be present. All egg yolks produced for the first 21 days and the forty-second, forty-ninth, and eighty-fourth days on the colorless ration were analyzed for total carotinoids. The egg yolks from the hens on this ration rapidly declined in pigment content for the first 10 or 12 days, after which the decline became more gradual. After 84 days on the low-pigment ration, the yolks from hens raised on the pigmented ration contained two or three times the pigment found in the yolks from hens raised on the low-carotinoid ration. Differences between the carotinoids in the eggs of the hens raised on the high- and low-carotinoid rations averaged 4.12 $\gamma$  more in the eggs laid from the eleventh

to the eighty-fourth day by hens raised on the higher carotinoid rations than by those raised on the low-pigment rations. This difference was highly significant, as the  $t$  value was 5.55 and only 2.8 was required for significance at the 1-percent level. There seemed to be obtained a small but persistent amount of pigment from some source other than the feed, probably from the body tissues. Large differences were found between hens, but no differences were found between breeds in the pigmentation of the eggs.

**Blood and meat spots in chicken eggs,** F. P. JEFFREY. (N. J. Expt. Stas.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 363-374, illus. 1).—Confirmation of the findings of Nalbandov and Card (E. S. R., 92, p. 692), that "hemorrhages causing the formation of blood clots in eggs occur before ovulation" and that "meat spots result from the transformation of blood clots, under the influence of changes in pH and high environmental temperatures, either prior to ovulation or during egg formation, or even after the egg is laid," is presented from observations on eggs from four breeds of chickens—Single-Comb White Leghorn, Legbar, Barred Plymouth Rock, and Rhode Island Red. In a total of 23,385 eggs broken out, three size gradations of blood spots were recognized, with classification as blood spots, red or pale meat spots, and white meat spots. Records were made of the percentage of meat spots of different types in each month of the season from November to August, inclusive, for the eggs laid by the four breeds. The Rhode Island Reds were in part in cages and in part on the floor. Blood spots were most numerous at the start of the laying year and least numerous at the end of the laying year. Pale meat spots increased in frequency during laying. Colored meat spots were common in brown eggs of heavy breeds, but less common in tinted eggs from the Legbar and rare in white eggs of the Single-Comb White Leghorn. Marked individual bird differences in color and size of meat spots in their eggs were noted. No marked seasonal changes in the instance of white meat spots were apparent.

**Poultry meat for home and market,** C. S. PLATT (*New Jersey Stas. Hints to Poultrymen*, 32 (1944-45), No. 2, pp. [4]).—Directions for broiler and roaster production, including general methods of caponization and management, with recommended mashes for starting chicks and finishing broilers.

## DAIRY FARMING—DAIRYING

**The galactopoietic action of pituitary extracts in lactating cows, I-III** (*Jour. Endocrinol.*, 4 (1945), No. 2, pp. 194-204, illus. 4; pp. 205-211, illus. 4; pp. 212-218, illus. 1).

**I. Dose-response relations and total yields during declining lactations,** S. J. Folley and F. G. Young.—Following up previous investigations (E. S. R., 86, p. 822), it was found that the milk production was 20 percent more than expected when a 2.5-gm. equivalent of fresh anterior pituitary tissue was administered to cows in declining lactation every second day for 3 weeks. An increase of 15 percent in yield continued for 2 weeks after the treatment ceased. The increase was less certain if smaller doses of the extract were used or if the extract was administered at intervals of 3 or 4 days. The relation of the response to the single injections and the dose of the extract is expressed as a sigmoid curve. Extracts prepared from whole ox pituitary gland, fresh anterior-lobe tissue which had been allowed to remain at room temperature for 24 hr., and an extract of acetone-desiccated anterior-lobe tissue were not obviously less galactopoietic than standard extracts of fresh anterior-lobe tissue. Extracts of ethanol-desiccated anterior pituitary tissue were largely inactive. There was no deleterious effect of repeated injections of anterior pituitary extract on pregnant cows. A total of 85 cows in

declining stages of lactation were used in this study of the milk yield after administration of different amounts of extracts of anterior pituitary, thymus, and whole pituitary glands. Stale extracts and controls were also employed.

II. *The response during the peak of lactation*, H. T. Fawns, S. J. Folley, and F. G. Young.—Milk production of 15 cows remained at a steady high level for about 7 weeks following calving, after which it declined even though the cows received extracts of pituitary sufficient to stimulate milk production in declining lactation. Although the normal cows did not respond, the galactopoietic influence was noted in 2 cows that aborted. It appears that the factor limiting output of milk in the declining stage after calving is not the rate of liberation of endogenous anterior pituitary secretion. This endocrine factor may be a limiting one in cattle that have aborted or have reached the period of declining lactation.

III. *Comparison of extracts of pituitary glands from different species*, S. J. Folley, F. H. Malpress, and F. G. Young.—Extracts of horse pituitary were more active in stimulating milk production in cows than extracts of ox pituitary glands. Sheep and pig pituitary extracts showed little or no activity. The milk production results were not correlated with the prolactin content of the glands from which the extracts were made, supporting the belief that prolactin is not the only or necessarily the most important factor concerned in the galactopoietic action of anterior pituitary extracts. The study was based on 24 cows in declining lactation divided into 6 groups of 4 cows each. Pituitary extracts from sheep and pigs caused a substantial and sustained depression in milk production when administered at 2-day intervals for 2½ weeks. Possibly this fall was the result of rapid antihormone formation to heterozygous glandular material.

**Induction of lactation in goats and cows with synthetic oestrogens and anterior-pituitary extracts**, S. J. FOLLEY, F. H. MALPRESS, and F. G. YOUNG (*Jour. Endocrinol.*, 4 (1945), No. 2, pp. 181-193, illus. 4).—Lactation was induced in virgin goats by simultaneous treatment with estrogen and anterior pituitary extract sooner than with estrogen alone. In two of five experiments in which prolonged estrogen treatment failed to induce lactation, copious milk secretion followed the institution of anterior pituitary extract injections. Galactopoietic effect was exerted by anterior pituitary extract at the peak of lactation in heifers and virgin goats.

**Herd demonstrates efficient dairying; provides answers to numerous problems**, A. A. BORLAND (*Pennsylvania Sta. Bul.* 461, Sup. 2 [1945], pp. 4-6, illus. 6).—Over a 54-yr. period the average milk and butterfat yield of the station dairy herd has more than doubled. Vitamin A has been found important to promote thriftiness in calves. Yearling heifers receiving 4 to 6 lb. of cottonseed meal per day for 6 mo. without green roughage developed symptoms of vitamin A deficiency, but the heifers promptly recovered and displayed no further symptoms when they received daily 1 oz. of cod-liver oil, ½ lb. of fresh carrots, or 3 lb. of timothy or alfalfa hay of good quality. No symptoms of malnutrition were observed, even though there were consumed up to 6 lb. of cottonseed meal daily for 10 mo. Normal calves were dropped 6 weeks after being taken off the experiment as long as cod-liver oil, good pasture, or hay of green color was available. About 500 units of vitamin D were needed per day per 100 lb. live weight to promote normal growth and well-being of the calves up to 7 mo. of age. Irradiated dry yeast was used as a supplemental source of vitamin D. Alfalfa or timothy hay with corn silage furnished satisfactory amounts of calcium and phosphorus for moderate production and normal development of the calf before birth. Other studies have been made of supplemental minerals, effect of season of freshening on yield of milk, use of corn-and-cob meal and molasses for preservation of legume silages, "sulfa" drugs for calf scours, prepartum milking to prevent udder congestion, and the production of B vitamins by bacteria in the rumen.

**Legume silage for dairy cows**, S. A. HINTON, C. E. WYLIE, and G. A. SHUEY (*Tennessee Sta. Cir.* 89 (1945), pp. [2]).—In a test of 96 days' duration, three groups of four cows each received, in addition to hay and concentrates, corn silage, corn-soybean silage, and soybean silage preserved with phosphoric acid. The cows in the three groups produced averages per cow per day, respectively, of 22.18, 22.69, and 19.96 lb. of milk and 1.069, 1.068, and 0.978 lb. of butterfat. The group receiving soybean silage preserved with phosphoric acid gained less weight and produced slightly less milk and butterfat than the cows in the other two groups.

**Milk is an essential war weapon—it must be produced same as ships and munitions**, E. L. FOURS. (*Fla. Expt. Sta.*). (*Fla. Grower*, 53 (1945), No. 3, p. 19).

**Heating makes butterfat keep**, D. V. JOSEPHSON and C. D. DAHLE. (*Pa. Expt. Sta.*). (*Food Indus.*, 17 (1945), No. 6, pp. 630-633, illus. 4).—"Increased oxidation resistance through proper heat treatment may improve the keeping quality of butterfat included in manufactured dairy products, processed foods, and candy, thus maintaining flavor over longer periods."

**The manufacture of butter from sour cream**, E. W. BIRD. (*Iowa Expt. Sta.*). (*Natl. Butter and Cheese Jour.*, 36 (1945), Nos. 5, pp. 34-36; 6, pp. 29-30, 70, 72, 74).—This deals largely with methods of reducing overacidity.

**Matting of cottage cheese**, T. B. HARRISON and W. M. ROBERTS (*Tennessee Sta. Cir.* 90 (1945), pp. [2]).—Study was made of the relation of acidity, amount of rennin, addition of fat, and enzymes to matting in cottage cheese. Matting was rarely produced at 0.45 to 0.50 percent acidity. Rennin added at rates of 1 to 50 cc. per 1,000 lb. of milk did not cause matting, but the curd lost much whey and became tough. The effects of fat were variable.

**A new cellulose gum stabilizer for ice cream**, D. V. JOSEPHSON and C. D. DAHLE. (*Pa. Expt. Sta.*). (*Ice Cream Rev.*, 28 (1945), No. 11, pp. 32, 76, 78, 80).—Preliminary tests indicate that sodium carboxymethylcellulose is odorless and tasteless and is an efficient stabilizer for ice cream at concentrations ranging from 0.15 to 0.20 percent of the mix. It imparts a "chewy" body and good texture to the ice cream and enhances the whipping properties of the mix.

**The ice cream industry of Central America**, A. C. DAHLBERG. (*Cornell Univ.*). (*Ice Cream Trade Jour.*, 41 (1945), No. 5, pp. 18-19, 40-46, illus. 8).

## VETERINARY MEDICINE

**Common diseases of farm animals and poultry**, W. C. BUTLER (*New York: McKesson & Robbins*, 1945, pp. 96+). This publication deals with the more common diseases as to symptoms, causes, and treatments.

**Effects of various sulfa compounds on the protozoan parasite, *Eimeria tenella***, C. A. RISOM and C. A. HERRICK. (*Wis. Expt. Sta.*). (*Jour. Parasitol.*, 31 (1945), No. 2, pp. 98-108).—When Single-Comb White Leghorn chickens 2 days to 2½ months of age were given sulfadiazine at the rate of 0.0128 gm. per gram of bird, it was an effective preventive of cecal coccidiosis either as 1 percent of the feed or in single doses. When given on the third day of infection, it materially reduced its severity, and when given on the fifth or sixth day it prevented oocyst infection. It remained at a protective level for not more than 1 day when given as a single large dose, and once the oocysts had formed in the tissues of the host it did not influence their viability. At 2 or 3 percent levels in the feed it had a marked deleterious effect.

Sulfathiazole was the most effective of other compounds tested. It prevented infections when given before or after the time of infection, but had no effect after the sporozoites had become established.

Calcium content of tissues from rats receiving different sulfonamides, F. J. PILGRIM and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 1, pp. 17-21).—Rats receiving sulfasuxidine in a purified ration exhibited a marked increase in the calcium content of the liver within 4 to 8 weeks. The increased calcium content is apparently a primary metabolic defect and not a secondary calcification following necrosis. Rats fed sulfathiazole show the same syndrome but not so consistently. The calcium of the kidney and muscle of rats fed sulfasuxidine or sulfathiazole is not increased. The altered calcium metabolism of the liver can be reversed or prevented by feeding solubilized liver for 10 to 40 days. Rats receiving sulfadiazine have an increased calcium content of the kidneys but not of liver or muscle.

Disinfection and sterilization, E. C. McCULLOCH (*Philadelphia: Lea & Febiger*, 1942, 2. ed. rev., pp. 472+, illus. 68).—This second edition (E. S. R., 76, p. 848) has been extensively revised to include the substantial contributions of the past decade.

Influence of casein and other agents on the production of renal lesions in rats by sulfadiazine and acetylsulfadiazine, A. KORNEBORG, K. M. ENDICOTT, F. S. DAFT, and W. H. SEBRELL (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 24, pp. 661-675).—Sulfadiazine (1 percent) in a purified diet of low casein content (10 percent) fed to rats for 30 days resulted in the uniform production of severe renal lesions. Casein, urea, sodium bicarbonate, and sodium chloride were found to exert preventive actions on the development of these renal lesions, despite restriction of water intake. Sodium bicarbonate was found to be the most effective of these agents under the specific conditions of this study. Acetylsulfadiazine, despite its greater solubility and lower blood concentration than free sulfadiazine, was found to be far more toxic than free sulfadiazine as judged by the incidence and severity of renal lesions and by survival.

*Aspergillus ustus*, J. M. KURUNG (*Science*, 102 (1945), No. 2636, pp. 11-12).—An antibiotic identified as a strain of *A. ustus* has been found, from the culture filtrate of which a substance can be obtained that definitely inhibits the growth of *Mycobacterium tuberculosis* in vitro.

Notes on animal diseases.—XXIV, Plant poisoning, J. R. HUDSON (*East African Agr. Jour.*, 10 (1944), No. 2, pp. 101-108, illus. 6).—This is an annotated list of plants and plant materials causing losses of stock from poisoning in East Africa.

Amphiachyris dracunculoides as a poisonous plant, F. C. GATES. (*Kans. State Col.*). (*Kans. Acad. Sci. Trans.*, 48 (1945), No. 1, pp. 87-89).—This plant, which increased in eastern Kansas to an amazing extent during the recent drought decade, was found to be seldom eaten but capable of causing gastroenteritis, at least in cattle. It was also responsible for a disturbance of the eyes, coughs, and dermatitis under field conditions, at least in human beings and calves.

Two poisonous milkweeds, A. H. HOLMGREN (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 2, pp. 11-12, illus. 2).—The two species described, the whorled milkweed (*Asclepias galloides*) and *A. labriformis*, are said to be exceedingly poisonous and despite their lack of palatability to be responsible for many of the sheep and cattle losses in southern Utah.

Sorghum halepense pers poisoning in cattle and sheep, H. S. BAWA (*Indian Jour. Vet. Sci. and Anim. Husb.*, 13 (1943), No. 4, pp. 326-327+, illus. 1).—In this study of the toxicity of Johnson grass (*S. halepense*), said to be common in India under the name of bariwari grass, sudden deaths in cattle and sheep due to grazing on very young shoots were recorded. No ill effects were noted when the mature plant was cut, stored, and fed to livestock.

A search for virus-inactivating substances among microorganisms, D. JONES, F. R. BEAUDETTE, W. B. GEIGER, and S. A. WAKSMAN. (N. J. Expt. Sta.). (*Science*, 101 (1945), No. 2635, pp. 665-668).—One hundred and fifty organisms, comprising bacteria, fungi, and actinomycetes, were isolated from straw compost, manure, soil, drainage material, and soil enriched with virus concentrates, and were tested for antiviral activity in vitro. Three of these organisms gave indications of possible inactivation of some of the fowl pox virus, and, in one case, of the laryngotracheitis virus. The active principle of 1 of the 3 organisms, a strain of *Actinomyces antibioticus* (S-4), was actinomycin A, an antibacterial substance known to be highly toxic to animals. The other 2 organisms, *Trichoderma* sp. and *Actinomyces* sp., were less extensively studied.

Studies of listerellosis.—VI, Isolation of *Listeria monocytogenes* from liver of pig, D. L. KERLIN and R. GRAHAM. (Univ. Ill.). (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 4, pp. 351-352).—*L. monocytogenes* was isolated from the liver of a pig not displaying clinical symptoms indicative of a central nervous system involvement. Its presence in the liver is said to represent the third occasion in the authors' laboratory in which *Listeria* has been isolated from tissue other than the central nervous system, and raises the question of its pathologic significance in nonencephalitic syndromes swine. See also previous notes (E. S. R., 83, p. 250; 90, p. 682).

A new salmonella type: *Salmonella pensacola*, A. B. MORAN and P. R. EDWARDS. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 1, pp. 52-54).—A new type isolated from gastroenteritis in man is described and assigned the formula IX, XII:g,m,t . . .

Two new *Salmonella* types belonging to somatic group D, D. W. BRUNER and P. R. EDWARDS. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 4, pp. 289-290).—Continuing this study of *Salmonella* types (E. S. R. 92, p. 560), *S. italiana* and *S. napoli* are described. The former contained an undescribed antigen in phase 2 and is assigned the formula IX, XII : lv-1, 11 . . . , while the second is represented by the formula IX, XII : lsu-e,n,x . . .

*Salmonella pomona* and *Salmonella champaign*, two hitherto undescribed types isolated from fowls, P. R. EDWARDS. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 4, pp. 291-292).—*S. pomona* was isolated from a turkey poult and represented by the formula XXVIII : y-1,7 . . . . *S. champaign*, which possessed an undescribed somatic antigen, was isolated from a hen and assigned the formula XXXIX : k-1,5 . . . .

The coagulase test for staphylococci, H. I. FIELD and H. W. SMITH (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 1, pp. 63-69).—Coagulase slide tests were carried out on food, human, and animal strains of staphylococci with human and animal plasmas. Coagulase production was confined to pathogenic strains of staphylococci, and the test is deemed specific for the identification of these strains. Plasmas can be used from human, ox, mouse, rabbit, and cat species for the slide test. Very occasional strains may not be detected by dog and pig plasmas, while horse, sheep, and guinea pig plasmas have been found most unreliable. On the basis of previous work, and together with the evidence presented, it is suggested that organisms of the genus *Staphylococcus* may be divided into coagulase-positive strains (*S. pyogenes*) and coagulase-negative strains (*S. saprophyticus*), and that division on the basis of pigment production may well be discontinued.

A field study of latent tularemia in rodents, with a list of all known naturally infected vertebrates, A. L. BURROUGHS, R. HOLDENRIED, D. S. LONGANECKER, and K. F. MEYER. (Univ. Calif.). (*Jour. Infect. Diseases*, 76 (1945), No. 2, pp. 115-119).—Latent tularemia infection was found in *Rattus norvegicus*, *Microtus californicus*, and *Peromyscus maniculatus*. None of these ectoparasites was infected.

The possibility of an aerogenic transmission of tularemia among some rodents is suggested. A list of vertebrates known to be naturally infected with tularemia is included. In addition to many nondomestic animals, this list includes the dog, cat, sheep, and calf.

**The infection of ticks (*Dermacentor variabilis*) with *Pasteurella tularensis*,** J. F. BELL (Univ. Minn.). (*Jour. Infect. Diseases*, 76 (1945), No 2, pp. 83-95).—In this study an attempt, based principally on analogy to the results of similar studies on plague, was made to determine the nature of the barriers to the spread of tularemia among ticks. Individual variations in susceptibility to infection were a possible cause of lack of uniformity of infection in ticks of an exposed group, and it is suggested that increased susceptibility to infection might result from decreased vitality. Bacteriophage was not discovered in any of the experiments. In the few samples tested, the fecundity of infected ticks was not diminished as measured by the production and fertility of ova, nor was viability adversely affected. The data indicate that the epizootic course of tularemia does not depend merely on a large number of ticks and the presence of many suitable hosts, nor does "hereditary" transmission appear to be of significance for *D. variabilis*, as no evidence of infection thus transmitted was obtained.

It was demonstrated that infected ticks feeding on immune or normal hosts lose their infection, presumably as a result of the stimulating effect of the blood meal upon a normal bactericidal function of the tick's gut, but before losing their infection as a result of feeding, infected ticks may inoculate the host, whereupon the host, if it is not immune, will develop septicemia and infect all ticks feeding upon it. Infected ticks feeding on immune hosts, on the other hand, permanently lost their infections and the bacteria were not transmitted to normal ticks feeding concurrently.

The importance of immune animals in limiting the spread of tularemia was indicated.

**Immunization of white rats against infections with *Pasteurella tularensis*,** C. L. LARSON (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 26, pp. 725-734).—The resistance of white rats to infection with *P. tularensis* was found to be of such a magnitude that they could be employed as test animals in studying immunity in tularemia. Active immunity to infections with *P. tularensis* was produced in them by the administration of vaccines prepared from yolk sacs of infected chicken embryos. Ether extraction of infected yolk sac suspensions enhanced the antigenic value of yolk sac vaccines. A specific soluble antigen was demonstrated in the aqueous phase of ether-extracted yolk sac vaccines.

**Chromo-vaccination des pasteurelloses,** P. REMLINGER (*Arch. Inst. Pasteur Algérie*, 23 (1945), No. 1, pp. 50-55).—Vaccinations of rabbits with fuchsin cultures of *Pasteurella bovisepica* and *P. aviseptica* are noted. Neither species of *Pasteurella* would protect against the other. Further steps needed for effective vaccination against pasteurelloses are discussed.

**Abnormal milk: Its relation to public health with suggestions for the production of a safe milk,** J. E. W. McCONNELL (*Milk Plant Mo.*, 34 (1945), No. 4, pp. 26-28, 30, 71-73).—This address discusses infections and intoxication due to milk, with suggested remedies.

**Observations on infertility in a dairy herd, with special reference to *Trichomonas foetus* infection,** J. G. WRIGHT and G. H. ARTHUR (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 1, pp. 49-62).—The clinical course of an outbreak of infertility in a herd of Friesian cattle is described. The chief causes of the condition were: (1) *Trichomonas foetus* infection with failure to conceive, abortion, and pyometra, and (2) endocrine dysfunction associated with absence of heat and classified, according to the ovarian findings on rectal examination, as

suboestrum, anoestrus, and cystic ovaries. Of 77 females exposed to *T. foetus* infection by service, 16 conceived and carried to term and no evidence of the disease was seen; 23 became infected and of these 4 aborted and 4 others developed pyometra; 38 failed to conceive, but the parasite was not isolated from them. Trichomonads were not recovered from the bulls used during the period of spread of infection, either during life or post mortem. Methods of treatment are discussed.

**Comparison of the immunising value in guinea-pigs of living avirulent *Brucella abortus* vaccines, strains 45(20) and S.19.** R. S. DE ROSS (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 1, pp. 70-84)—The behavior in the guinea pig of *B. abortus* strains 19 and 45(20) was studied. Both strains were found incapable of multiplying to any extent in the spleen, or of producing enlargement or lesions in this organ. After inoculation of  $3 \times 10^6$  viable organisms, it was found that strain 45(20) persisted in the spleen for up to 12 weeks; strain 19 was eliminated in less than six.

*B. abortus* strain 544 was found to be of high virulence for the guinea pig, capable of invading and multiplying in the spleen in which it produced lesions and considerable enlargement. It persisted in the spleen for longer than 15 weeks, and caused the appearance of agglutinins to high titer in the blood serum which persisted after the organisms themselves had been eliminated.

In general, vaccines prepared from strain 19 conferred a better and more rapid immunity against strain 544 than did vaccines prepared from strain 45(20). Three small doses of vaccine given at fortnightly intervals conferred as good an immunity as did a single dose of vaccine containing 300,000 times as many viable organisms. A single dose of a vaccine prepared from strain 19 administered to guinea pigs between 3 and 4 weeks old conferred an immunity which persisted until the animals reached maturity. Neither of the two vaccines proved capable of rendering a group of guinea pigs completely resistant to infection with strain 544 even when the animals were exposed to infection with as few as 300 viable organisms of the virulent strain. In such cases 20 to 30 percent of the animals were always found to be infected, though the amount of infection was very small as compared with that of unvaccinated controls. Agglutination titers proved a less reliable index of infection than did the percentage of spleen weights.

**The propagation of *Brucella abortus* in the mouse.** R. S. DE ROSS (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 1, pp. 85-92)—Mice were inoculated with *B. abortus*, strains 544 and 19, and the progress of infection studied. The strain more virulent for cattle and guinea pigs (strain 544) propagated in the mouse rather more readily than did strain 19. The difference in behavior of the two strains was much less marked than it is in the guinea pig. The route by which the organisms were introduced had a very definite effect on their subsequent propagation. Intravenous or intracerebral inoculation resulted in a far higher degree of infection than did intramuscular or intraperitoneal inoculation. It was shown that the infection attains its maximum extent within a week from inoculation, but had not significantly changed at 3 and 5 weeks after inoculation.

It is concluded that the mouse does not become readily infected with *B. abortus*, though infection, once established, tends to persist for a considerable time. "For the purpose of comparing the degree of virulence of different strains of *B. abortus*, the mouse is much less valuable than the guinea pig."

**A study of the immunological properties and infectivity of *Brucella abortus* strain 45/20, McEwen, in cattle.** S. J. EDWARDS, R. S. DE ROSS, and D. H. MCLEOD (*Vet. Rec.*, 57 (1945), No. 22, pp. 259-265).—Following a study with heifer calves made of the strain described by McEwen (E. S. R., 83, p. 106; 86, p. 247), it is concluded that "the use of a living *B. abortus* vaccine prepared from strain 45/20 protects cattle against clinical contagious abortion and confers considerable immunity

against infections with virulent *B. abortus*." Although the number of animals involved in the experiments reported was small, "the evidence points to the fact that strain 45/20 after inoculation into the nonpregnant cow may in some animals persist in the tissues and subsequently undergo mutation from the rough state to a smooth virulent form."

**Bovine brucellosis:** The use of live vaccines in the control of the disease, J. K. H. WILDE (*East African Agr. Jour.*, 10 (1945), No. 4, pp. 239-242).—A program using strain 19 vaccine in bovines of all ages above 4 mo. is described as most applicable under present conditions in East Africa.

The occurrence of bovine contagious pleuropneumonia in Assam, V. R. GOPALAKRISHNAN (*Indian Jour. Vet. Sci. and Anim. Husb.*, 13 (1943), No. 4, pp. 287-293, illus. 1).—This disease, which appears to exist in India only in Assam, occurs there as a specific epizootic with a tendency to spread in a slow and insidious manner. The causal organism (*Borrelomyces peripneumoniae*) was isolated by the Imperial Veterinary Research Institute, and it is believed to be the classical contagious bovine pleuropneumonia occurring elsewhere.

**Estimación de los daños de la pasada epidemia de aftosa [Estimation of the losses from the recent epidemic of foot-and-mouth disease],** R. INCARTE (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 17 (1945), No. 1, pp. 35-42, illus. 2; Eng. abs., p. 42).—An outbreak in the principal dairy region of Uruguay in 1943 is described and the losses caused to the dairy industry are evaluated.

Observations on the blood picture of Johne's disease in sheep and cattle with special reference to the magnesium content of the blood, J. STEWART, J. W. McCALLUM, and A. W. TAYLOR (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 1, pp. 45-48).—Analyses of blood samples from 19 sheep and 9 cows are tabulated which showed that in animals exhibiting clinical symptoms of Johne's disease the hemoglobin and calcium contents of the blood may be low and the magnesium content very low. It is suggested that this lowering of the magnesium content may be a useful aid in the diagnosis of the disease.

Ovine paratuberculosis (Johne's disease of sheep), A. W. TAYLOR (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 1, pp. 41-44).—It is concluded from these studies that this disease is widespread in Scotland, and that it may be caused by either of two organisms. One of these is the classical type of *Mycobacterium johnei*, and the other a closely related organism differentiated only by its resistance to artificial cultivation. For this the term is suggested of *M. johnei* (ovine type).

Studies of sheep parasites.—V, Immunity to gastrointestinal nematodes, P. A. HAWKINS and C. L. COLE. (*Mich. Expt. Sta.*). (*Jour. Parasitol.*, 31 (1945), No. 2, pp. 113-118, illus. 4).—Using the methods of egg-counting described earlier in this series (E. S. R., 91, p. 74), the authors found in studies with an ewe and three lambs that exsheathed strongyle larvae of sheep react to immune serum from naturally infected sheep by the formation of a precipitate in one or more of the following locations: (1) Mouth, (2) anus, (3) excretory pore and/or (4) cuticle. The mechanism of immunity against the nematode parasites of the alimentary tract of sheep is described. "After a certain stage in the infection, antibodies are formed. These are capable of forming a precipitate around the mouth and excretory openings of the larvae. Since the severe effects of parasitism in sheep are largely due to the cumulative effects of constant reinfection, it is readily seen that the host may acquire an immunity which will prevent reinfection."

Contributions to the study of swayback in lambs, I, II (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 1, pp. 19-40, illus. 2).

I. **Field experiments**, A. H. Hunter, A. Eden, and H. H. Green (pp. 19-28).—A survey made in Derbyshire about 2 yr. following the widespread use of salt licks

containing copper sulfate as a prophylactic measure of ewes in affected areas (E. S. R., 83, pp. 234, 681) indicated that sway-back was still the greatest single cause of losses in lambs in the area, and led to a reopening of the study. Field experiments were carried on testing specifically the effects of copper and other trace elements administered orally to pregnant ewes, by observations on the efficacy of copperized licks, and by attempted induction of sway-back in susceptible ewes fed a ration low in copper.

In experiments on 5 farms of varying geological formation and with 371 ewes, a high measure of lamb protection was secured when copper sulfate at the level of 0.5 gm. was given the ewes once a fortnight, but cobalt, iodine, iron, and manganese were without significant effect. On 18 farms with 840 ewes, copper in lick form gave a high degree of protection on most farms, but there were some serious breakdowns, possibly from failure to consume the copper. When a group of 40 ewes from the area, selected as having given birth to sway-back lambs in previous years, was transferred to Weybridge and fed a ration supplying about 5 mg. of copper daily (less than one-third of that estimated to be consumed in their natural habitat), no cases of sway-back developed. "This indicates that low daily intake of copper is not the only factor in the etiology of the disease."

II. *Blood copper investigations*, A. Eden, A. H. Hunter, and H. H. Green (pp. 29-40).—Blood copper studies in the above investigation were carried on. The copper status of the ewes in October was very low with a mean value of 0.051 mg. percent, and practically half were below 0.04 mg. percent. Copper-treated groups showed slight improvement in January, and by March only 39 percent lay below 0.06 mg. percent. The improved copper status of the treated ewes was reflected in the much lower incidence of sway-back in the resulting lamb crop. The Derbyshire ewes transferred to Weybridge showed a rapid improvement in blood copper levels and an eventual absence of sway-back.

**Chemotherapy of swine erysipelas:** Trials using sulfanilamide, sulfapyridine, and sulfathianazole in experimental infection of mice, H. KONST (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 5, pp. 135-139).—Sulfanilamide, sulfapyridine, and sulfathianazole were administered to mice for an average of 10 days prior to inoculation with *Erysopelothrix rhisopathiae*, but in no case was there adequate control of the infection. It is regarded as unlikely that these drugs will prove of value in the treatment of swine erysipelas.

**Report on infectious equine encephalomyelitis in the United States in 1944**, A. W. MILLER (*U. S. Dept. Agr., Bur. Anim. Indus.*, 1945, pp. 4, illus. 2; also in *Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 820, pp. 10-13, illus. 2).—This report includes comparative data for the decade beginning in 1935.

**The effect of chlorination on the virus of Eastern equine encephalomyelitis in the presence of organic substances**, J. E. KEMPF, M. E. PIERCE, M. G. WILSON, and M. H. SOULE (*Jour. Infect. Diseases*, 76 (1945), No. 2, pp. 120-125).—Observations that the virus of poliomyelitis may survive chlorine concentrations greatly in excess of those ordinarily used for the protection of municipal water supplies and thus may spread the disease led to studies here reported with the closely similar virus of Eastern equine encephalitis, which was substituted because it could be tested with albino mice instead of currently unobtainable monkeys. Suspensions of infected mouse brain tissue (1-1,000 m. l. d's.) in distilled water prepared so that there was no chlorine demand were consistently inactivated by 0.75 p. p. m. to 0.90 p. p. m. of chlorine (ortho-tolidine indicator); 0.68 to 1.10 p. p. m. (starch-iodide indicator). The potency of the virus seemingly was not involved between values of 1-1,000 m. l. d's.; more virulent material was not studied. When the distilled water suspensions were mixed with 0.75 percent monkey spinal cord, 0.01 and 0.02 percent gelatin, or river water, an increase in chlorine concentrations was

essential for inactivation. Since these substances all had definite chlorine demands the virus was suspended in river water, and the break point technic of chlorination as carried out in municipal practice was studied. The findings were inconsistent, but it could be concluded that water containing chlorine in excess of the amount required to produce a break point was destructive to the virus. Distilled water suspensions of the virus were inactivated with chlorine and an attempt made to reactivate the virus by the addition of sodium thiosulfate or by dilution. The results were negative.

Vaccination with various western equine encephalomyelitis viruses, comparison as antigens and as test inocula, P. K. OLITSKY, I. M. MORGAN, and R. W. SCHLESINGER (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 1, pp. 93-97, illus. 1).—The immunological identity of four strains of this virus was confirmed by tests in mice. A strain recently isolated from *Culex tarsalis* in the Yakima Valley, Wash., appeared to be somewhat superior in antigenic potency to the other three strains. Mice vaccinated with comparable doses showed equal resistance to three of the strains, but tests with the fourth, the strain in current use in the Rockefeller Institute, did not appear to be a sensitive indicator of the degree of immunity in vaccinated mice.

**El efecto "in vitro" de la tiourea y otros compuestos químicos sobre el virus encefalomielítico tipo Venezuela (The "in vitro" effect of thiourea and other chemical compounds on the Venezuelan equine encephalomyelitis virus), F. GALLIA (*Bol. Inst. Invest. Vet. [Venezuela]*, 2 (1944), No. 7, pp. 203-248+; Eng. abs., pp. 244-248).**—The in vitro effect on the Venezuelan equine encephalomyelitis virus of urea, thiourea, propylene glycol, glycolic acid, thioglycolic acid, the methyl ester of thioglycolic acid, and urotropine was investigated. The inactivating power over the virus seemed to be enhanced by the presence of sulfur. Of the glycols, the most effective inactivator of the virus when diluted in saline was the methyl ester of thioglycolic acid, followed by thioglycolic acid, but both of these were without effect on the virus diluted in broth serum. Thiourea in a concentration of 9 percent inactivated the virus in both saline and broth serum, but only when added to dilutions of the virus already made. The union of thiourea and virus is stable, and the thiourea destroys the antigenic properties of the virus completely, as shown in test inoculations intracerebrally into mice.

The "in vitro" effect of thiourea on the Venezuelan equine encephalomyelitis virus, F. GALLIA (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 5, pp. 131-134).—This article is essentially a condensation of the work noted above.

The effect of small repeated doses of phenothiazine on strongylid infestation in the horse, T. E. GIBSON (*Vet. Rec.*, 57 (1945), No. 25, pp. 301-303, illus. 1).—Five instances are cited in which the administration of daily doses of 1 gm. of phenothiazine did not result in the elimination of strongylid worms from horses. There was, however, a fall in the egg count to a very low level or to zero attributed to the inhibition of egg production. This inhibition persisted in all but one case for as long as 35 days after the cessation of treatment.

Sensitive-fern poisoning of horses, E. F. WALLER, F. S. PRINCE, A. H. HODGDON, and N. F. COLOVOS (*New Hampshire Sta. Tech. Bul.* 83 (1944), pp. 8, illus. 3).—Toxicity trials with mixed hay containing from 15 to 20 percent by weight of sensitive fern (*Onoclea sensibilis*) showed that one of the two horses fed this hay developed unsteadiness after 42 days' feeding, followed by increased incoordination, and on the sixth day was unable to stand. On autopsy the only gross lesions of any significance were extreme icterus, paralysis of the alimentary tract, swollen liver, and edema of the brain. The ventricles of the brain were distended with blood-tinged fluid. Microscopically, the liver cells showed cloudy swelling and fatty infiltration as well as some destruction of the cell nuclei. There was also

a very extensive edema of the entire brain, with numerous hemorrhages into the brain tissue, and a degeneration of the neuron cells with a resulting invasion of Glia cells. The second horse developed a hyperesthesia about 2 weeks later without visible skin lesions. This condition persisted for about 4 weeks but gradually lessened in intensity and disappeared. A third horse fed fern-free hay remained in good condition. Brief notes are given on other cases with similar brain lesions, as well as observation by veterinarians which indicated that all horses were not equally susceptible to the toxicant.

**Case reports of relatively infrequent diseases observed at the poultry pathology laboratory,** A. B. WICKWARE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 6, pp. 151-154, illus. 3).—Case reports are given on ulcerative enteritis in a White Leghorn pullet, teratoma in a White Wyandotte cockerel, and infection with *Pasteurella avicida* in a flicker.

**A sanitary program for the poultry farm,** L. M. BLACK (*New Jersey Stas. Hints to Poultrymen*, 32 (1944), No. 1, pp. [4]).—General directions are given for enforcing a strict program of sanitation and quarantine.

**Orbital deformity and visual impairment due to lopping of the comb in the chicken,** N. M. NELSON. (U. S. D. A.). (*Anat. Rec.*, 92 (1945), No. 1, pp. 77-79, illus. 2).—In experiments with Single-Comb White Leghorn males, it was shown that the lopping of combs of excessive size causes a deformity of the bony orbit with displacement of the eye globe. The result is that the optical axis is deviated from the normal to the extent that vision is impaired or completely occluded.

**Natural transmission of avian-lymphomatosis,** N. F. WATERS. (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 3, pp. 226-233).—Observations on the occurrence of avian lymphomatosis in about 4,700 White Leghorn chickens from 9 flocks and subjected to several different environmental conditions were described with reference to the natural transmission of the disease. All chicks were reared in complete confinement and subjected to strict sanitation and quarantine. Lymphomatosis was present in chickens under 4 mo. of age, even though direct contact with infected birds was prevented. The disease is transmitted both by the egg and by direct contact with infected birds. The occurrence of lymphomatosis to at least 700 days of age was generally prevented by careful selection and rearing in isolation of certain families subjected to rigid quarantine. The prevention of the disease by rearing in confinement and rigid sanitation is not insured unless the parents are disease-free.

**The treatment of cecal coccidiosis with sulfamethazine,** P. A. HAWKINS and E. E. KLINE. (Mich. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 3, pp. 277-281).—Preliminary studies with 4-week-old chicks of various breeds showed that sulfamethazine interferes with normal weight gains in uninfected birds. In concentrations of 0.4 to 1.0 percent in the feed it will greatly diminish death losses from cecal coccidiosis when given not later than 4 days after infection. Sulfamethazine blood levels of approximately 5.0 to 6.0 mg. percent by the fifth day after infection are necessary to prevent loss. A saturated solution of sulfamethazine in galvanized iron containers was ineffective, while in paraffined containers the results were variable.

**Sull' azione protettiva del siero iperimmune contro il virus dell' epizoozia dei polli 1940 [The protective action of hyperimmune serum against the 1940 virus of fowl epizootic]** V. GARINER (*Bol. Soc. Ital. Biol. Sper.*, 18 (1943), No. 3-4, pp. 122-124).—A curative as well as a preventive action was observed.

**Fowl paralysis: The infectivity of fowl tissue suspensions to baby chicks,** F. D. ASPLIN. (Coop. U. S. D. A. and Mass. Expt. Sta.). (*Poultry Sci.* 24 (1945), No. 4, pp. 379-382).—A disease similar to that reported by the author in England (E. S. R., 91, p. 341) was induced in chicks from the flock of the U. S. D. A.

Regional Poultry Research Laboratory by the injection of tissue suspensions from spontaneous cases of neurolymphomatosis obtained from a flock in Massachusetts and three well-separated flocks in Michigan. Two of these strains, Massachusetts 6 and Michigan 10, proved sensitive to sulfathiazole. The most conspicuous lesions were present in the liver and heart and bore a striking resemblance to those seen in pullorum disease. It is concluded that these findings give further support to the contention of Blakemore (E. S. R., 82, p. 109) that the agent of neurolymphomatosis is involved in the production of typical fowl paralysis, and that this disease may be widely distributed in the United States.

Further observations on the demonstration of an infective agent in the tissues of fowls affected with fowl paralysis (neurolymphomatosis), F. BLAKEMORE (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 1, pp. 1-18+, illus. 10).—Continuing work previously noted (E. S. R., 82, pp. 109, 258), the infectious nature of fowl paralysis was confirmed by the inoculation of suspensions of lymphomatous lesions into susceptible chicks. Fourteen outbreaks were examined in this way, and a virus was demonstrated in 12. In the first group of chicks to be inoculated the response was mild, but by serial passage it was possible to increase the virulence of the virus. A marked variation was found in the susceptibility of chicks of different origin to the early response which followed the inoculation of virus, and a resistant stock showed only a low incidence of neurolymphomatosis. The view that this latter condition represents a chronic stage of the experimental disease was supported by the demonstration of an age-developing, virus-suppressing state and a higher incidence of neurolymphomatosis in fowls of a susceptible strain inoculated before this became fully developed. The infective agent was found to be filtrable and behaved like a virus. There was no evidence that the virus stimulated a multiplicity of specific neoplasms or leukemic conditions, and even after repeated passage it showed no tendency to become of a true leukemic type.

A study of methods for the isolation of *Salmonella pullorum*, L. D. BUSHNELL and J. J. PORTER. (Kans. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 3, pp. 212-215, illus. 2).—Results of the isolation of *S. pullorum* on postmortem with the media used were inconsistent, and no single medium used proved satisfactory. "Desoxycholate citrate, bismuth sulfite, and SS agar are the most satisfactory for isolating *S. pullorum* from the intestine. To these may be added tetrathionate broth as an enrichment medium."

Studies in pullorum disease.—III. Serological differences in strains of *Salmonella pullorum*, R. GWATKIN and E. W. BOND (*Canad. Jour. Pub. Health*, 36 (1945), No. 4, pp. 160-166).—This part (E. S. R., 92, p. 270), notes that the whole blood test on 294 chicks tested 5 or 6 weeks after exposure by mouth to variant strains of *S. pullorum* showed 191 positive with variant antigen. Twenty of these were positive with regular type antigen. If positive and questionable reactions had been grouped, as is done in routine testing, 185 birds would have been missed by the regular antigen. A second test of these birds was carried out between the eightieth and one hundred and second days by whole blood and tube tests. The regular antigen failed to detect 74 samples classed as positive or questionable by the variant type. Recovery of the organism from chicks which had died of pullorum disease, and from the ovary of many that died later from coccidial infection and other causes, afforded proof of the specificity of the variant strain reactions. This was further supported by the absence of reactions in known negative birds. In 815 tests, only 2 birds would have been removed. Among the miscellaneous samples tested, 63 chicks injected with the regular strains showed a preponderance of variant agglutinins 6 days after injection. Two months later, after further injections of the same organisms, the predominating agglutinins were of the regular type. The marked difference in antigenicity of the strains

is regarded as making it clear that neither type would be satisfactory for detecting the heterologous agglutinins.

A convenient method for preparing graduated capillary serological pipettes for use in pullorum agglutination test, E. W. BOND (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1915), No. 6, pp. 166-167, illus. 1).—An ordinary capillary pipette, accurately graduated and equipped for convenience with a rubber nipple, is described as delivering the required amount of serum with more precision than the regular 1-cc. pipettes. Directions for making it are given.

**Pullorum testing of turkeys,** L. D. BUSINELL. (Kans. Expt. Sta.). (*Poultry Sci.*, 21 (1945), No. 3, pp. 208-211).—Examination of 187 birds, of which 140 were reactors and *Salmonella pullorum* was isolated from 76, indicated that for turkeys the tube agglutination test (1:25 dilution) is the most satisfactory, with the 1:50 dilution tube test as second choice. The whole blood stained antigen test was less satisfactory than the rapid serum test and the latter was less selective. The author concludes that "all birds giving even a slight and slow reaction with the stained antigen should be removed from the flock. The usual 2-min. incubation period recommended for chicken blood is not long enough for turkeys."

[**Pullorum control**] (*Northeast. Poultryman*, 40 (1945), No. 4, pp. 6-13, 15, illus. 2).—A symposium, from which are noted the following: The Pullorum "Bug," by E. R. Hitchner (p. 6) (Univ. Maine); The Prevalence of Pullorum Disease Among Tested Flocks in the Northeast, by H. Van Roekel (p. 7) (Mass. State Col.); Control and Sanitation, by T. B. Charles (p. 8) (Univ. N. H.); Transmission and Control of Pullorum in Incubation, by A. L. Romanoff (p. 9) ([N. Y.] Cornell Expt. Sta.); U. S. and State Pullorum Classes, by M. A. Jull (p. 10) (Univ. Md.); Public Reaction to Official Pullorum Flock Status, by J. Kroeck (p. 11); Hereditary Resistance to Pullorum Disease, by E. Roberts and L. E. Card (p. 12) (Ill. Sta.); Economic Aspects of Pullorum Disease Control and Eradication, by P. B. Zumbro (p. 13) (U. S. D. A.); and Pullorum Disease or Coccidiosis, by C. A. Bottorff (p. 15).

**Sulfonamides in the control of fowl typhoid,** J. C. HAMMOND (*Poultry Sci.*, 24 (1945), No. 4, pp. 382-384).—Following outbreaks of fowl typhoid in a large flock of pullets, sodium sulfathiazole was given in the drinking water and reactors to the pullorum tube and the *Salmonella gallinarum* rapid whole blood tests were removed from time to time. Eradication was secured. See also a note by Severens et al. (E. S. R., 93, p. 352).

**Diseases of turkeys on the range,** M. L. MINER (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 2, pp. 1, 14-15, illus. 1).—Brief descriptions are given of staphylococcosis, infectious sinusitis, hexamitiasis, infectious enterohepatitis, pendulous crop, and trichomoniasis.

## AGRICULTURAL ENGINEERING

**Ground-water resources of the El Paso area, Texas,** A. N. SAYRE and P. LIVINGSTON (*U. S. Geol. Survey, Water-Supply Paper* 919 (1945), pp. 190+, about 37 illus.).—El Paso, Tex., and Ciudad Juarez, Chihuahua, Mexico, and industries in that area draw their water supplies from wells 600 to 800 ft. deep. The water-bearing beds lie in the deep structural trough known as the Hueco bolson. The Rio Grande has eroded the flat-bottomed, steep-walled El Paso Valley, 6 to 8 miles wide and 225 to 350 ft. deep. The quality of water in this valley varies both vertically and laterally. It is highly mineralized to a depth of 400 to 500 ft., but good water may be obtained between 500 and 900 ft. The hydraulic gradient in the deep water-bearing beds is toward the river, but in the shallow water-bearing beds in the valley is away from the river, showing that these beds receive their recharge, estimated at 15 million gal. daily, from the river.

Beneath the uneroded upland part of the bolson, known as the Mesa, the water level varies from 200 to 400 ft., and is of satisfactory quality containing less than 500 p. p. m. of dissolved solids. The water table beneath the Mesa is moving southeast, toward the Rio Grande. Two cones of depression in the water table have been formed by the pumping near El Paso—one in the vicinity of the Mesa well field, the other around the Montana well field. The water released from storage in the Mesa field was calculated at 22,000 acre-ft., but total pumpage was estimated as 90,000 acre-ft., indicating that three-fourths of the total pumpage came from recharge. About 210,000 acre-ft. of water has been pumped from the cone of depression in the El Paso Valley. The amount of water that would be recovered from storage for a distance of 10 miles north of the Mesa well field was calculated at about 130,000 acre-ft., equivalent to about 7.5 years' supply at the 1935 rate of pumping, plus the annual recharge available.

The chloride content of all of the wells in the field has been increasing because the static water level in the shallow beds yielding poor water is higher than that in the deeper beds. If the level in the lower beds continues to decline, seepage from the river will eventually force the shallow highly mineralized water laterally and downward into the beds bearing fresh water. Pumpage from deep wells in the valley should be maintained at a minimum, and any additional wells necessary to maintain the pumping at the present rate should be drilled only as needed in the area north of the Mesa well field. Measurements of water levels and samples of water for analysis should be taken in selected wells regularly every 6 mo. to determine the accuracy of the conclusions and give advance warning of conditions regarding the quantity of potable water available for the El Paso supply.

Surface water supply of the United States 1943, parts 10, 13, 14 (*U. S. Geol. Survey, Water Supply Papers* 980 (1945), pp. 185+, illus. 1; 983, pp. 223+, illus. 1; 984, pp. 235+, illus. 1).—These papers record stream-flow measurements for the year ended September 30, 1943, No. 980 covering the Great Basin; No. 983 the Snake River Basin; and No. 984 the Pacific slope basins in Oregon and lower Columbia River Basin.

Subsoil water investigations at the Huntley Branch Station, S. H. HASTINGS and D. HANSEN. (Coop. U. S. D. A.). (*Montana Sta. Bul.* 428 (1945), pp. 26, illus. 6).—A report on results of investigations made over a period of 19 yr. of (1) the depth of the root zone above the subsoil water, (2) the seasonal and annual fluctuations of the water table, (3) the extent to which the water table is influenced by seepage from the main irrigation canal passing through the station, and (4) the concentration of dissolved salts carried in irrigation water.

Mutual irrigation companies: Their activities, problems, and performance, O. W. ISRAELSON, J. H. MAUGHAN, and G. P. SOUTH (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 2, pp. 8-9, illus. 4).—Of the State as a whole, the authors note that Utah has 1,973 diversion dams and nearly 400 storage dams which provide a surface-reservoir capacity for 3,400,000 acre-ft. of water. It has also 410 pumping plants and 8,750 miles of unlined earth canals. More than \$42,000,000 is invested in irrigation work, and a much larger sum is needed. More than \$1,500 000 is spent annually for the maintenance of Utah's irrigation structures. The extensive plant thus summarized is maintained and operated mainly by mutual irrigation companies serving areas of from 100 acres or less to more than 30,000 acres each. Data indicative of the results of a survey of the State as a whole are taken from a preliminary check of conditions found in Sanpete County, in which some 87,000 acres are irrigated by 49 companies of which 28 deliver water to more than 300 acres each and 12 to lesser acreages. Continuous flow and call delivery of water are little-used methods of distribution, by far the greater quantity of water being delivered by a rotation system involving intervals between turns of from

7 to 30 days—average 17 days. More water is needed, and less wasteful distribution, especially reduction of seepage losses in unlined canals and of loss by improper application, offers a possibility for improvement.

Some economic aspects of the situation are briefly analyzed.

**Farm drainage in the future**, P. W. MANSON. (*Agr. Engin.*, 26 (1945), No. 3, pp. 111-113, illus. 3).—Owing to a succession of wet seasons, with the all-out drive for food production, there is developing among the farmers of the Middle West an intensified interest in farm drainage. It is believed that any soil-saving program after the war ends must include drainage. The flat bottomlands when properly drained offer no erosion problem and will maintain their high fertility. Intensified farming will be practiced on the relatively flat land, much of which has been made productive through drainage. Modern soil-saving practices will be used on the sloping land in a long-time program requiring much drainage foresight. Much drainage will continue in the Corn Belt area, as the reclaimed wet lands of the Mississippi River Basin are so productive when drained that farmers in this section cannot afford to neglect drainage. The past few wet years have exposed many outlet ditches that are not functioning properly, and the farmer must be made to realize the importance of good maintenance. In areas quite remote from the Corn Belt and where the annual precipitation is as low as 20 to 25 in., farmers are now demanding drainage. During the past 25 yr., sufficient research has been conducted so that today we can almost design a drainage system based on facts. Studies of relative runoff, spacing and depth of laterals, soil permeability, crop injury, quality of tile, capacities, and maintenance have helped to gain the good will and confidence of the public.

**Lignum-vitae wood for processing applications**, J. R. CALLAHAM (*Chem. and Metall. Engin.*, 51 (1944), No. 5, pp. 129-131, illus. 3).—A report on the hardest, heaviest, and closest grained wood known, giving its unique properties, typical applications, and present uses.

**Laminated wood has great possibilities for stronger, more rigid farm structures**, N. A. NORTON (*Pennsylvania Sta. Bul.* 464, Sup. 2 [1945], pp. 8-9, illus. 2).—The author briefly describes plywood and laminated wood, pointing out the great extension of the range of usefulness of these materials as a result of the introduction of water-resistant glues. Of new experimental observations, the author notes that preliminary results, as derived from standard tests on small specimens, have indicated that air-dry, laminated yellow poplar beams are, on the average, from 10 to 25 percent stronger and 15-20 percent more rigid than solid beams of the same species. The laminated material also showed an increase in toughness of 14-50 percent over normal wood. This property apparently is influenced by the manner in which the load is applied, however, higher values being obtained when the force acted on the face of the laminations. Small laminated columns showed an increase of approximately 25 percent in endwise compressive strength over normal yellow poplar. The material used in fabricating the test blanks was  $\frac{3}{8}$ -in. rotary-cut veneer, and the test results are not deemed applicable to laminae of other thicknesses. In general, there was a noticeable increase in the weight of laminated wood over that of normal yellow poplar, due to the presence of the glue line.

So far, the chief use in farm buildings has been limited to rafters, which may be obtained in one piece, extending from the foundation to the roof ridge. This permits continuous side and roof construction and eliminates the usual joint between walls and roof, a recognized point of possible structural weakness. A barn so constructed has increased strength, rigidity, and wind resistance. The use of laminated rafters results in greater unobstructed floor space, since posts and columns can be eliminated in many cases—an advantage, for example, in vehicle and machine sheds. Erection cost is said to be low. Fire resistance of the building

may also be increased. Much of the small-sized, more inflammable materials used in ordinary framing is avoided; and, in some types of laminated framing, the members are of larger cross section, since fewer are used. In general, laminated construction will give greater strength with less material than will standard building methods.

**Bamboo for reinforcement.** (Coop. Univ. P. R.). (*Puerto Rico Fed. Sta. Rpt.* 1944, p. 31).—Report by B. C. Reynolds and A. C. Soler, on tests, using *Bambusa vulgaris* as a reinforcing medium in concrete for slabs, beams, and columns, indicated that bamboo strips having a cross-sectional area four times that required for steel gave little or no additional strength over unreinforced checks.

**A technical analysis of the belt conveyor.** W. G. HUDSON (*Chem. and Metall. Engin.*, 51 (1944), No. 7, pp. 104-108, illus. 5).—The author gives some of the high lights of his 35 yr. of experience with the belt conveyor and describes belts and accessories, driving equipment, and drive methods and lists the chief sources of trouble and their correction.

**A new fertilizer distributor and planter for the southern farmer.** G. W. GILES. (N. C. Expt. Sta.). (*Agr. Engin.*, 26 (1945), No. 3, pp. 109-110, illus. 4).—The small southern farm is deemed perhaps the least efficiently mechanized unit in the entire farming industry of the United States. On these farms it takes approximately 150 man-hr. to grow and harvest 1 acre of cotton and approximately 50 man-hr. to grow and harvest 1 acre of corn. This inefficiency has persisted largely because of the prevalence of so-called cheap hand labor and the lack of proper equipment. The present war period, by draining this man power into war activities, offers an opportunity to make great strides toward mechanization if the proper equipment is made available. The combination fertilizer distributor and seed planter described in this paper was designed especially for small farmers now clamoring for labor-saving equipment. In place of six separate operations in fertilizing and planting row crops performed by five machines and with 5.5 trips required for each row, the fertilizer distributor and seed planter described, called the "Once-Over," combines them into a single operation, places the fertilizer correctly, and results in the efficient use of fertilizer, an increase in crop yields, a saving in labor, and a saving in power. Seven machines were built by a manufacturer in North Carolina and kept in the State to study, eliminate faults, and smooth out manufacturing design problems. They were sold to farmers for \$55 each.

**Mow curing of hay.** B. A. JENNINGS (*Agr. Engin.*, 26 (1945), No. 3, pp. 104-108, illus. 3).—To obtain additional information on the principles underlying the curing of hay in the mow by the blowing of air through the hay, research was undertaken at Cornell University as a part of a general hay research project. Observations and laboratory conclusions from the 1944 tests, which are based on only one year's work show: (1) The quicker the hay is dried, the greener will be the color of the finished product; (2) the higher the moisture content of the material at loading, the greener the color of the hay; (3) mow-cured hay appears to have a higher percentage of moisture than field-cured hay of the same moisture content; (4) the temperature of hay while curing is below the temperature of the air from the fan; (5) the amount of temperature drop varies with the moisture content of the hay, the amount of air, and the humidity of the air; (6) there is no danger of the hay heating in mow curing, so long as there is sufficient air, and so long as the hay is properly distributed; (7) increasing the amount of air increases the rate of curing, or it decreases the time required; (8) the amount of air required and the fan size should be based on the amount of water in the load rather than on the area of the mow floor; (9) hay with a high moisture content will dry even when the air has a high relative humidity; (10) hay will not take on

moisture when the relative humidity of the air is high, unless the hay is well below the safe-keeping stage; (11) continuous blowing is better than other methods studied for controlling the fan; (12) the heating of hay while the fan is not in operation apparently produces a limp and dense mass causing difficulty in air travel; (13) molding of hay is permitted by too slow a rate of curing; (14) the molding and decay of hay is one of the bigger problems in mow curing; (15) spot molding of hay in an otherwise satisfactory mow is probably due to incorrect air travel; (16) air leakage at the side walls and posts and at the mow floor can be controlled by tramping the material to make it more dense at these places; (17) chopped, crushed, or fine hay must be lower in moisture content than coarse whole hay for an equal rate of curing; (18) alfalfa hay apparently gives better results in mow curing than does clover hay; and (19) the more promising results obtained with the laboratory equipment should be checked under field conditions for confirmation.

**What's happening in farm buildings?** W. ASHBY. (U. S. D. A.). (*Agr. Engin.*, 26 (1945), No. 3, pp. 101-103, illus. 8).—A great deal of attention is being given by public service groups and industry to the place of farm buildings in our national economy and the need for solving farm building problems. In proportion to income, farmers are spending much less than city people for buildings. The available data indicate that from 1915 to 1943 farmers spent an average of less than 5 percent of their net income for housing, and less than 10 percent of net income for all buildings, fences, wells and windmills, whereas it is generally considered that the average city family spends 15 to 25 percent of its income for housing. We must assume that farmers have been spending as much as they think buildings are worth in proportion to other goods and services, but the question is what would they be willing to pay for improved types of farmhouses and other buildings that would cut chore time, eliminate most of the 100-million-dollar annual farm fire loss, greatly reduce shrinkage and damage to fruits, vegetables, and grains in storage, improve the quality and feeding value of hay, increase milk and egg production, save an average of eight pigs per litter instead of six, and provide cleaner, pleasanter, and more comfortable living and working conditions all around the farmstead. To improve the situation the author recommends the following steps be taken: (1) Adequate research to determine the functional requirements for each type of building, to find means of reducing man-hours of labor, to test structures developed to meet new and higher standards, and finally to obtain more building value per dollar; (2) an expanded extension program; (3) teaching and vocational training courses; and (4) a system of financing building improvements.

**The pen barn and milking room in Michigan,** C. H. JEFFERSON and E. WEAVER (*Michigan Sta. Cir.* 195 (1945), pp. 35, illus. 28).—An analysis of expressed opinions taken from 78 replies to questionnaires sent 137 operators who have had experience with pen barns regardless of whether they were using them at the time. The advantages and disadvantages of the pen barn as compared to the stanchion-type dairy barn are listed. Typical pen barn plans for new construction and suggestions for the remodeling of old barns into pen barns are given, showing photographs and corresponding floor plans for the structures.

**Orchard products of higher quality possible with farm-type cold storage,** F. N. FAGAN (*Pennsylvania Sta. Bul.* 464, Sup. 2 [1945], pp. 1- illus. 3).—The author describes briefly a storage building and equipment of which the inside building dimensions are 45 by 75 ft.: storage capacity is 12,000-14,000 bu.; cost of building \$6,000; cost of machinery \$3,000; and power consumption approximately 1 kw.-hr. per bushel per season. Some constructional detail is given. The storage is equipped with a 4- by 4-in. compressor providing direct expansion of ammonia

for refrigeration. Power is supplied by a 7.5 hp. electric motor. This equipment is capable of producing nearly 3 tons of ice every 24 hr. The pipe system and valves are arranged to permit the full refrigerating power of the unit in one room at a time or in all of the rooms at the same time. Control is automatic, the usual storage temperature at the floor being 32° F., with the ceiling a degree or two higher. Minus 15° is readily obtainable in the low-temperature room. Another storage of equal size may be cooled with the same refrigerating unit, provided it, too, is divided into two rooms. In this way, a single room may be cooled as fast as it is filled with warm apples. From then on, the load on the refrigerating equipment is not too heavy as long as the fruit is undisturbed.

Quick freezing performance of an experimental sub-zero food freezer, J. E. NICHOLAS. (Pa. Expt. Sta.). (*Refrig. Engin.*, 50 (1945), No. 1, pp. 29-31, 57-58, 62, illus. 6).—A report of some preliminary investigations of freezing whole tomatoes and packaged fruit and vegetables using a low temperature experimental freezer. Results obtained on the rate of freezing of foods indicate that all products pass through three stages: (1) Precooling, (2) freezing, and (3) subcooling. By freezing whole tomatoes without wrapping and immersing the product directly in the refrigerant, the time interval during the freezing stage is made of short duration. Tomatoes so frozen, on thawing could be sliced.

## AGRICULTURAL ECONOMICS

What peace can mean to American farmers: Post-war agriculture and employment (U. S. Dept. Agr., *Misc. Pub.* 562 (1945), pp. 28).—"The purpose of this analysis is to provide an aid to such understanding by describing the economic conditions likely to be associated with various degrees of employment and unemployment in the postwar period, and to indicate the most probable effect of these conditions on the price-and-income position of agriculture. The estimates presented are not forecasts of what will happen after the war, but are intended to illustrate what is most probable under stated alternative assumptions with respect to employment, price levels, productivity of labor, and related factors."

Production adjustments in Delaware agriculture in the post-war period, H. A. JOHNSON (*Delaware Sta. Pam.* 17 (1944), pp. 20+).—A report prepared in cooperation with the members of the Post-War Planning Committee for Agriculture in the School of Agriculture of the University of Delaware.

The food situation and outlook in continental Europe, the Mediterranean area, and the Soviet Union (U. S. Dept. Agr., *Off. Foreign Agr. Relat.*, 1945, pp. 21+).—The outlook for production, imports, and consumption of food supplies is briefly reviewed by countries. "Continental Europe's supply of food from domestic sources in the consumption year 1945-46 will be the smallest since the outbreak of war. The decline from the 1944-45 level may amount to from 5 to 10 percent for the Continent as a whole." "Considering this level of production, the increase in population, and the drastic curtailment of imports compared to the prewar period, it may be estimated that the per capita consumption of food in continental Europe thus far in 1944-45 has been at a rate around 85 percent of the prewar level, with a substantial deterioration in the qualitative composition of the diet. An average consumption of around 85 percent of the prewar per capita intake of energy, with a large part of the population (mostly the rural people) scarcely affected by the reduction in total supplies, indicates that there are millions of people who subsist on as little as three-fourths, two-thirds, or even one-half of their prewar calories."

Foreign Agriculture [May and June 1945] (U. S. Dept. Agr., *Off. Foreign Agr. Relat., Foreign Agr.*, 9 (1945), Nos. 5, pp. 65-80, illus. 1; 6, pp. 81-96, illus. 6).—Articles are included as follows: No. 5, Recent Developments in Italian Agricul-

ture, by V. B. Sullam (pp. 66-74), and Wartime Shifts in Latin American Agriculture, by J. J. Haggerty (pp. 75-80); No. 6, Agriculture in São Paulo, Brazil, by H. W. Spielman (pp. 82-95), and Food in Continental Europe (pp. 95-96), a summary of a report noted above.

**Current Farm Economics [April and June 1945]** (*Cur. Farm Econ. [Oklahoma Sta.], 18 (1945), Nos. 2, pp. 27-37+, illus. 1; 3, pp. 41-68+.*).—Both numbers include the usual review of the agricultural situation and the tables of indexes of prices and purchasing power of Oklahoma farm products, price indexes in the United States and Oklahoma, and indicators of changes in domestic demand. Number 3 includes an article, The Market for Cottonseed, by K. C. Davis (pp. 57-66), making appraisal from the standpoint of the market for cottonseed oil and cottonseed meal of the suggestion that the market for cottonseed could be developed to the extent that it would partially offset the reduction in income in the sale of cotton lint.

**Range lands of Utah County, Utah, and their utilization,** L. A. STODDART. (*Utah Sta. Bul. 317 (1945), pp. 32+, illus. 16.*).—The field seasons of 1940 and 1941 were devoted to a study of the range resources of the county. "The findings reported are based upon a study of the vegetation, its amount, quality, and condition, and upon management problems discovered in the process of the study. Detailed field studies were made of all range lands within the county. Management practices and problems discussed resulted from analysis of these studies and from the observations of operators and range administrators in the county." The history of range conditions in the county and the climate of the county are described. Among the subjects discussed are the range vegetation; landownership and control; erosion conditions; livestock and forage production; the seasonal balance between forage supply and seasonal distribution of the demand; and the range problems—proper stocking, range development, increased livestock feed, farm pastures, farm feed production, poisonous plants, and big game problems. The major problems in need of attention and scientific study are summarized.

**The land nobody wanted, II.** TIRUS (*Michigan Sta. Spec. Bul. 332 (1945), pp. 43, about 31 illus.*).—A description and discussion of the origin and development of the public domain in the State and changes in the land policy regarding it. The publication is based on material contributed by the director of the conservation institute, the extension specialist in conservation, and the extension leader of land-use planning, all of the Michigan State College, and the chief of the lands division of the Michigan Department of Conservation. The section, Classification and Recommended Use of Lands in 47 Counties (pp. 26-36), includes tables and graphs showing the ownership status in the 47 northern counties of the State, the ownership status and classification of all lands in 16 of the counties, and the use of the State land recommended by county use planning committees in the 16 counties and also for 4 of the individual counties.

**The trend of real estate taxation in Kansas, 1910 to 1942,** H. HOWE (*Kansas Sta. Cir. 228 (1944), pp. 40, illus. 9.*).—Some of the data in the previous study (E. S. R., 54, p. 483), covering the trends in real estate taxation from 1910-23, are brought up through 1942. The same methods in collecting and tabulating data were used. The trends in farm real estate and city real estate taxation are discussed, and an attempt is made to describe to what extent this general upward movement was caused by levies for the State and each of its subdivisions, and to what extent it was due to expenditures for each of the various public purposes, such as general administration, education, and roads—irrespective of political subdivisions.

The findings are summarized by the author as follows: "The period 1910-42 may be characterized, in general terms, as one of steadily increasing government

activity and consequent large increases in real estate taxes. . . . The burden on real estate would have been much greater had it not been for the introduction of important new sources of revenue to supplement the property tax. During the 20-yr. period 1910-29, inclusive, total farm real estate taxes increased on the average approximately one million dollars each year. Decreases occurred in the years from 1930-33. Although there has been considerable fluctuation since 1933, the total farm real estate tax has not varied much from the 1933 figure. During the 22-yr. period 1910-31, inclusive, total city real estate taxes increased on the average almost one million dollars each year. Although declines occurred in the years 1932-36, total city real estate taxes have tended to go upward during the most recent years covered in the study. In 1942, these taxes were only 10 percent lower than the figure in the peak year 1931."

**Eleventh annual report of the Farm Credit Administration, 1943-44 (U. S. Dept. Agr., *Farm Credit Admin., Annu. Rpt.*, 11 (1944), pp. 132+).**—In addition to the subjects covered in the previous report (E. S. R., 90, p. 114), the operations of the regional agricultural credit corporations, Agricultural Marketing Act revolving fund, and loans to purchase stock in agricultural credit corporations are discussed.

With this report, the period of the report is changed from the calendar year to the fiscal year. Pertinent data for the 6 mo. between the tenth and eleventh reports are covered in the present report. An interim report was also issued (E. S. R., 92, p. 129).

**Financing truck crops in three eastern Virginia counties, H. M. LOVE (*Virginia Sta. Bul.* 369 (1945), pp. 35, illus. 2).**—The counties surveyed were Accomac, Northampton, and Princess Anne. The short-time credit—amount used, sources, purpose for which used, arrangements and costs, the weaknesses of the present system, and possible improvements are discussed.

The 494 farms surveyed reported an average use of \$729 of short credit per farm in 1939. About 70 percent of the credit was used for the production of potatoes. Approximately 46 percent of all the credit in the three counties was applied to fertilizer purchasers and 33 percent to harvesting and marketing costs. Practically all short-time credit was obtained through the purchase of supplies on time accounts, and dealers supplied about 75 percent of the short-time credit. "Time and cash prices were obtained on a sufficiently large portion of the most important items to indicate that farmers were paying an average of 51.6 percent interest per annum on the cash price of 6-6-5 fertilizer for 6 months credit."

**Harvesting the corn crop, A. P. BRODEZ and H. R. WALKER (U. S. Dept. Agr., *Bur. Agr. Econ.*, 1945, F. M. 49, pp. 20+, illus. 8).**—"The proportions of the 1943 corn acreages that were harvested by hand, by machine methods, and by hogging and grazing are shown in this report. Also, it contains estimates of the proportions of the crop utilized in various ways and the custom rates for harvesting corn from the standing stalk." Most of the statistics are grouped by States or geographic divisions.

**Changes in the costs of producing Irish potatoes in the commercial potato area in Louisiana, 1942 to 1945, J. N. EFFERSON (*Louisiana Sta. Mimeog. Cir.* 43 (1944), pp. 17+).**—Some of the data collected from leading commercial potato growers in the lower commercial potato area of the State for the years 1942, 1943, 1944, and 1945 (based on conditions as of September 1944) are summarized and briefly discussed.

**Variation in economic efficiency of pens entered in the New Jersey flock mating test, C. S. PLATT (*New Jersey Sta. Hints to Poultrymen*, 31 (1944), No. 6, pp. [4]).**—Tables are included and discussed showing the returns over feed cost per pullet and relative efficiency of entries in the tests for 1942-43 and 1943-44, and a comparison of records of high and average pens in the two tests.

An economic analysis of turkey production in Utah, D. A. BROADBENT, W. P. THOMAS, and G. T. BLANCH (*Utah Sta. Bul.* 318 (1945), pp. 47+, illus. 14).—This study was made to show the relation of the turkey enterprise to other farm enterprises; to determine the average investments, costs, and returns from turkey production; to show the influence of production practices on returns; and to point out some factors that need to be considered in the future development of the turkey industry in the State. Enterprise record books for the 1942 season of 68 producers in Cache, Box Elder, Sanpete, and Sevier Counties were analyzed. Data as to number, weights, and grades of birds marketed, and quality and cost of feeds purchased, obtained from turkey processing plants and feed companies, were also used. The growth of the turkey industry in Utah, the factors influencing it, and the production practices are described. The size of flocks, investment in the turkey enterprise, the cost of producing turkeys, the receipts and profits from the turkey enterprise, and factors affecting costs and returns are analyzed and discussed. Recommendations are made for improving some of the production practices.

The average number of pouls per producer reported was 3,723, of which 2,757 reached a marketable state. The average cost of production was \$3.92 per bird or 23.3 ct. per pound. Feed costs constituted 58 percent, poult costs 22 percent, and labor 10 percent of the total costs. The farm sale price for all turkeys was 33.2 ct. per pound or \$5.58 per bird. "Four major factors which were closely associated with profits were: (1) Beginning the enterprise with day-old rather than with pouls that were already 'brooded out.' The average profit per bird for flocks started from day-old pouls was \$1.81 while from flocks of 'brooded out' pouls it was only \$1.05. (2) The size of the flocks. This had but little effect on the profits per bird but had a great influence on efficient use of capital and labor and also on total profits. (3) Mortality rates. The third of the flocks with the least mortality averaged profits of \$2.03 per bird compared with \$1.52 for the third with the highest mortality. . . . (4) Costs of feed and feeding practices. . . ."

The cost of producing milk, 1942-43, L. C. CUNNINGHAM ([*New York*] *Cornell Sta. Bul.* 818 (1945), pp. 14, illus. 1).—The study is based on farm management surveys for the year ended April 30, 1943, for about 25 farms each in Orange, Chenango, and St. Lawrence Counties and 102 farms in Oneida County. Information on farm receipts and expenses, farm inventories, crop acreages and production, and costs and returns in producing milk was obtained by personal visits to the farms. Economic conditions—feed prices and farm wages, size of farm business, herd replacements, and amounts of feed and labor per cow and per 100 lb. of milk—are described. Analyses are made of the cost of producing milk on an enterprise and farm basis, the return to labor used in producing milk, labor income, and labor earnings. Comparisons are made of the costs in 1942-43 with earlier periods and of the changes in actual costs and in the index of costs.

For the year ended April 30, 1943, the average cost of producing milk in the four areas was \$2.98 per 100 lb., and the average price received was \$2.91. The average farm income was \$1,371, and the return to labor in milk production was 37 ct. per hour. The cost of milk production had increased 44 percent over that in 1939-40. The average quantities of feed and labor per 100 lb. of milk were grain 33 lb., hay 67 lb., silage 127 lb., pasture 2.2 days, and man labor 2.6 hr.

Irrigated pastures produce large amounts of milk economically and show a high cash return per acre, G. Q. BATEMAN and J. E. PACKER (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 2, pp. 10-11, illus. 1).—Per acre returns from irrigated pastures at the dairy experimental farm at Logan are tabulated to show that "pastures seeded on good land yield high returns."

facilities in Kent, Sussex, and New Castle Counties, etc., are described briefly. More detailed descriptions are included of the different cooperative auction markets of the State and the produce markets in the city of Wilmington.

Retailing potatoes and other vegetables, Buffalo, New York, 1940, W. A. LEE ([*New York*] *Cornell Sta. Bul.* 814 (1945), pp. 61, illus. 2).—This study was made to obtain information concerning the effect of season and other factors affecting the retailing of potatoes and other vegetables. It is based largely on surveys made of 220 outlets during August and 185 during December 1940. The data were analyzed and discussed under sections dealing with the following subjects, among others: Importance of the different types of outlets; volume of different products handled; relations of family income and type of outlets to vegetable sales; spoilage as affected by kinds of vegetables handled, type of outlet and family income; relation of family income, type of outlet and weekly sales to the number of kinds of vegetables and fruits handled; displays; credit; delivery; relations of retail prices to income areas; type of outlets and sales per outlet; and retail margins as related to kinds of vegetables, type of outlet, family income, spoilage, etc.

"The average Buffalo family spent weekly only 21.4 ct. per capita for vegetables during August and only 15.6 ct. during December. Expenditures per family averaged 81 ct. per week in August and 59 ct. per week in December. The average family bought about 31 lb. of vegetables per week in August and about 19 pounds per week in December. . . .

"On the basis of vegetables sales per store, chain super markets took first place during August, with fruit and vegetables stores a close second, hucksters third, and meat markets fourth. In December, chain super markets and fruit and vegetable stores ranked first and second, respectively, but market stalls were third, and meat markets again fourth."

Average spoilage was 6.3 lb. per 100 lb. in August and 3.7 in December. No type of outlet was consistently lowest in spoilage, and the differences in income neighborhoods were not significant.

"There was no such thing as a single price per unit of any vegetable in all outlets at any given time. Prices for the same product varied widely both between and within various income areas. Prices paid by consumers were usually highest in high income neighborhoods, but this was not always so. . . . There was no regularly accepted, well-defined gross margin for vegetables. Margins differed as between income areas as well as between the various vegetables."

Among the conclusions the following are stated: "Growers, wholesalers, and jobbers—and often retailers themselves—seem to have greatly overrated the importance of the consumers in high income areas. This overrating is obvious in the persistent argument that 'high quality' products must be produced to cater to the 'high quality' trade. This survey shows that only 17 percent of the population—the much talked about 'quality market'—lived in high income areas. If more attention were paid to the needs of the other 83 percent, who buy a considerable amount of the 'high quality' as well as the lower grades of vegetables, probably greater consumption of vegetables might result. There has been much discussion concerning low consumption of fruits and vegetables in lower income families, the theory being that such families cannot afford to buy fruits and vegetables. Differences between highest and lowest income families as to their weekly expenditures for fresh vegetables were less than the cost of one 'movie' ticket or a couple of packages of cigarettes. It would seem to be a question of what the family income should be spent for, rather than the size of the income. If growers, wholesalers, jobbers, and retailers can convince consumers of the desirability of buying more 'protective' foods, such as vegetables, it seems likely that family expenditures for vegetables can be increased about 25 ct. per week. This seems like a very small sum, but it would

probably mean an appreciable increase in the demand for vegetables. Such an increase would also help solve the problem of surplus vegetable production, which is likely to confront the nation when war ceases. . . .

"Because of the erroneous but commonly held impression that potatoes are a fattening food, and because of the relatively great increase in production of some other vegetables, the fear has frequently been voiced by growers that the demand for potatoes has been shrinking rapidly. This survey shows clearly that potatoes are still by far the most important member of the vegetable family. The frantic effort of housewives to maintain 'normal' potato consumption during the spring of 1943, when supplies were short, indicates that potatoes will continue to maintain this position for some time to come."

**Marketing fruits and vegetables in Utah,** W. P. THOMAS and G. T. BLANCH (*Utah Sta. Bul. 316 (1945)*, pp. 67+, illus. 11).—This survey was made in cooperation with the agricultural market service committee, an advisory committee of 12 members appointed by the president of the Utah State Agricultural College. Specific objectives were to analyze and determine: (1) The volume and quality of fruits and vegetables marketed by areas; (2) the present geography of Utah's fruit and vegetable markets, and markets for these products that may be developed; (3) the competition on these markets, together with an analysis of economic and political influences that may effect or change this competition; (4) prices received on various markets; and (5) agencies providing marketing services and their efficiency. The several sections of the report analyze and discuss the quality rating of Utah produce on out-of-State markets; production of fruits and vegetables in Utah; geographic areas in which Utah produce is marketed; production areas with which Utah producers must compete; business organizations engaged in marketing Utah fruits and vegetables; marketing functions; and efficiency of marketing organizations. Other phases discussed are transportation costs; volume of produce shipped from Utah stations; destination of carlot shipments from Utah; packaging; processed fruits and vegetables; and the frozen fruit industry. Recommendations are made for improving the marketing of the fruits and vegetables of the State.

**Livestock auctions in Mississippi,** D. W. PARVIN (*Mississippi Sta. Bul. 400 (1944)*, pp. 87, illus. 1).—Data as to volume of business, facilities, plant organization, and operating methods were secured from 32 of the 37 auctions in operation in Mississippi as of November 1, 1943. Less complete data were secured from the other 5 auctions. Prices at which animals were sold in 1943 were tabulated from the records of 5 large, 3 medium, and 5 small auctions. In January 1944, data as to the attitude of farmers toward auctions and where they marketed their livestock were obtained from 929 usable questionnaires of the ones sent out through the vocational agriculture teachers and students.

The development of livestock auctions in the State, the facilities, plant organization, personnel, etc., are described. The operating methods, the attitude of farmers toward auctions, and their criticisms and suggestions are discussed. Analysis on a rather limited scale is made of the income, expenses, profits, financial responsibility, marketing charges, and prices received at the small, medium, and large auctions. Prices at the auctions are also compared with other markets.

Twenty of the 32 auctions were general-purpose auctions—sold livestock and practically any type of produce or merchandise assigned to them, 9 were livestock-mule auctions, and 3 straight livestock auctions. It is estimated that over 800,000 head of livestock, valued at approximately \$20,000,000, were sold through auctions in 1943. Selling charges were higher in Mississippi than in adjoining States or the United States as a whole, and farmers reported they would market more livestock through auctions if the charges were reduced. Prices paid at the auctions compared rather favorably with those at other markets. Danger of spreading disease was the

most common criticism made of the auctions by farmers. Higher prices and convenience were the chief reasons given by farmers for selling through auctions. For 7 auctions studied in detail, the chief sources of income were commissions (79.9 percent), trading operations (9.6), and yardage (7.4). The chief expenses were wages and salaries (34.1), truck and automobile expenses (17.5), losses (14.8), and feed (13.1).

**Prices of purebred cattle at auction**, E. G. MUSHLER (*Cornell Univ., Dept. Agr. Econ., A. E.* 485 (1944), pp. 11+, illus. 4).—Prices and number of head of purebred cattle sold are given by years for the Ayrshire, Guernsey, Holstein, Jersey, Aberdeen-Angus, Hereford, and Shorthorn breeds.

**Reducing damage to eggs and egg cases**, O. F. JOHNDREW (*U. S. Dept. Agr., Misc. Pub.* 564 (1945), pp. 24, about 37 illus.).—The chief factors causing damage to eggs and egg cases are stated and illustrated and suggestions made as to what producers, truckers, hucksters, packers, shippers, cold storage warehouses, manufacturers of cases, etc., should do to reduce the amount of damage.

**Some recent developments in the Connecticut milk markets, I-II**. (Coop. U. S. D. A. et al.). ([Connecticut] *Storrs Sta. Bul.* 254 (1945), pp. 40, illus. 6).—Two articles report the findings made by the station in cooperation with the U. S. D. A. Bureau of Agricultural Economics, the Connecticut Milk Administration, and the New England Research Council on Marketing and Food Supply.

**I. Milk production and consumption trends**, A. MacLeod and D. A. Clarke, Jr. (pp. 4-13).—This article discusses the trends of milk production and consumption in the State in recent years, especially in 1943 and 1944.

**II. The emergency milk purchase program of 1943**, D. O. Hammerberg and W. G. Sullivan (pp. 14-26).—This article "describes the emergency milk purchase program that was carried on by Connecticut dealers in November and December 1943, the manner in which it operated, and the extent to which it accomplished its objectives."

Appendixes include (A) Statistics Relating to Milk Consumption and Production in Connecticut, 1938-45 (pp. 27-36), and (B) Agreement Signed by Handlers Participating in the Emergency Purchase Program and Weekly Reporting Form (pp. 37-40).

**Efficiency of milk marketing in Connecticut.—IX. Conservation possibilities in retail delivery in major markets**, R. G. BRESSLER, JR., D. A. CLARKE, JR., and S. K. SEAVIER ([Connecticut] *Storrs Sta. Bul.* 253 (1944), pp. 46, illus. 13).—This, the third and final bulletin (E. S. R., '42, p. 428) which deals with the efficiency of retail milk delivery in Connecticut, presents the results obtained in studies of the cities of Hartford and New Haven. For the Hartford market, it describes the dealers serving the market, the delivery densities, and the present delivery system, and discusses the reorganization possibilities—exclusive delivery territories, reorganized mileage requirements, and deliveries from one central plant. For the New Haven market, general characteristics, geographic distribution of dealers and of consumption, and the present delivery system are described and discussed; and the reorganization studies on allocating territories for all dealers and for limited groups of dealers and deliveries from central plants are discussed. Other sections of the report deal with the estimated costs of delivery of milk for the two cities, and milk delivery in all Connecticut markets.

**Frozen food locker plants: Location, capacity, rates, and use, January 1, 1943**, S. T. WASHINGTON and P. C. WILKINS (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt.* 81 (1945), pp. 45+, illus. 14).—General facts regarding the nature of the development of frozen food locker operation as of January 1, 1943, are set forth statistically. Information of interest to present and prospective

operators of plants and others is evaluated. The survey was made just prior to the wartime rationing program being put into operation in March and April 1943.

**State councils and associations of farmer cooperatives,** J. L. SCARCE (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 82* (1945), pp. 33+, illus. 1).—The organization features and activities of each State council or association are presented, and a table is included showing the important organization characteristics.

**Income, expenses and savings of local cooperative associations,** H. M. HAAG (*Missouri Sta. Res. Bul. 389* (1945), pp. 30, illus. 1).—“This study is concerned with the financial results of the business operations of 110 local cooperative associations or ‘exchanges,’ 10 of which are multiple-unit organizations with 22 places of business. The results are for the four calendar years, 1939 to 1942, except for a few associations with fiscal years ending other than on December 31.”

“It is thought that this analysis of present tendencies may point out probable future difficulties and assist the local associations in preparing themselves for the postwar period.” For the 100 single-unit associations the general situation—type and volume of sales, margins, special services, expenses, receipts, savings, etc.—is discussed. Analysis is made of the effects on income, costs, and savings of size of business (sales volume) and areas in which the association is located. The effects of changing times are also discussed. The sales, margins, other income, local savings, patronage refunds, etc., of the single- and multiple-unit associations are compared. Comparison is also made by areas of the State.

**The place of cooperatives in the fertilizer industry,** J. G. KNAPP (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 85* (1945), pp. 13+, illus. 2).—A preliminary report of a study “designed to furnish general information on the place of cooperatives in the commercial fertilizer industry and to describe briefly the growth, methods, problems, and accomplishments of such associations.”

**Farmers' cooperatives and the trend toward large-scale dairy plants,** D. E. HIRSCH (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 80* (1945), pp. 31+, illus. 8).—“This report has been prepared in an attempt to present a relatively comprehensive picture of the development and characteristics of the trend [toward large-scale dairy plants], and to emphasize its relationship to the urgent need for reorganization and consolidation of many existing cooperative dairy associations.”

**Organizing honey marketing cooperatives in wartime,** H. M. BAIN (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 79* (1945), pp. 28+, illus. 2).—Some of the questions arising in the organization of honey marketing cooperatives are answered. Suggested articles of incorporation, bylaws, marketing agreement, etc., are included.

**Farm production, farm disposition, and value of principal crops, 1943-44 by States,** P. L. KOENIG ET AL. (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1945*, pp. 61+, illus. 2).—“This report includes estimates of grains, hay, seeds, potatoes, fruits and nuts, and some other commodities,” but not cotton, cottonseed, tobacco, sugar beets and sugarcane for sugar, chickens, eggs, turkeys, milk, and meat animals.

**Crops and Markets [April 1945]** (*U. S. Dept. Agr., Crops and Markets*, 22 (1945), No. 2, pp. 69-108, illus. 1).—The usual quarterly publication. It includes crop, livestock, and marketing reports; reports of storage of grains on farms, farm employment and wages, farm real estate values, feed production, supply and disappearance, prices received and paid by farmers, etc. The prospective plantings as of March 1945 of different crops are given, with comparisons of planted acreages in 1944 and averages 1934-43.

**Annual crop summary, 1944,** R. E. STRASZHEIM, T. L. CANADA, M. M. JUSTIN, and J. R. GARRETT. (*Coop. U. S. D. A.*). (*Indiana Sta. Ind. Crops and Livestock*, No. 231 (1941), pp. 28).—A continuation of the series (E. S. R., 92, p. 430).

**Assessors' enumeration of 1943 crops,** R. E. STRASHEIM, T. L. CANADA, M. M. JUSTIN, and J. R. GARRETT. (Coop. U. S. D. A.). (*Indiana Sta., Ind. Crops and Livestock*, No. 232 (1945), pp. 16).—A continuation of the series (E. S. R., 92, p. 430).

Production, prices, and value of selected crops, livestock, and livestock products in Louisiana, 1910-1944, J. P. MONTGOMERY (*Louisiana State Univ. and Sta. Mimeog. Cir.* 49 (1945), pp. 45+, illus. 1).—A series of statistical tables.

**Statistics on commercial peanuts by months and seasons, September 1938-August 1944** (U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 48+, illus. 11).—The statistics cover farmers' stock peanuts, shelled peanuts (edible grades), cleaned peanuts, oil stock, crude peanut oil, and peanut meal.

**Annual livestock summary, 1945,** R. E. STRASHEIM, T. L. CANADA, M. M. JUSTIN, and J. R. GARRETT. (Coop. U. S. D. A.). (*Indiana Sta., Ind. Crops and Livestock*, No. 233 (1945), pp. 28).—The summary is as of January 1, 1945, and tables are included showing, for periods of different lengths, the numbers and values of different kinds of livestock, chickens, etc., amounts and values of dairy and poultry products, prices, purchasing power, and other statistics.

**Dairy and poultry market statistics, 1944** (U. S. Dept. Agr., War Food Admin., Off. Market. Serv., 1945, CS-13, pp. 61+).—A continuation of the annual summaries of market statistics (E. S. R., 92, p. 430).

Farm production, disposition, and income from milk, 1943-44, and miscellaneous dairy statistics (U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 29+, illus. 4).—The publication is composed chiefly of tables. The first section deals with the farm production of milk, butterfat, and butter, disposition of milk produced, and quality, price, and value of dairy products sold by States. The second part deals with manufactured dairy products, with tables on monthly production, prices, etc. Tables are also included showing milk dealers' average buying prices and prevailing monthly retail prices in 25 cities for milk delivered at homes.

## RURAL SOCIOLOGY

**Population problems** (*South Carolina Sta. Rpt.* 1944, pp. 13-14).—The average per capita net farm income for South Carolina farmers for 1944 is estimated at approximately twice as great as the figure of \$606 reported in 1939 and the average earnings of workers in industry have also increased though at a somewhat slower rate, but State incomes in both agriculture and industry are still much below the national average. While much of this improvement in agricultural income is attributable to higher prices for farm products, some of it results directly from increased production with fewer workers and because of an increasingly high level of industrial activity. In 1930 only half of all workers were engaged in non-agricultural work, but by 1944 it was estimated that two-thirds of the gainfully employed were working in industry, the trades, transportation, and other nonfarm jobs. Birth rates are the lowest and levels of living the highest in urban and industrial sections of South Carolina. At present rates of population increase and employment, only 46 percent of the white farm boys and 35 percent of the Negro farm boys reaching maturity during the decade 1940-50 will be needed to replace farm workers who die or retire.

The recent increase of persons in the social security ages, T. L. SMITH. (Ia. State Univ.). (*Amer. Sociol. Rev.*, 10 (1945), No. 3, pp. 411-418).—Indications of a tendency for persons beyond the prime of life to add a year or so to the chronological reality for their ages, as revealed in the 1940 census, are ascribed to a desire for agreement with data that were being supplied in other connections because of an interest in earlier participation in the social security program.

**Disadvantaging factors in the life of rural Virginia Negroes,** H. W. ROBERTS (*Va. State Col. Gas.*, 51 (1945), No. 1, pp. 58, illus. 3).—Following emancipation, rural Negroes in Virginia made great progress economically, educationally, politically, and socially. They shared in the government of the State until practically eliminated as participants by the State Constitutional Convention of 1901-2, through its revision of the suffrage provisions. Since 1910 there has been more or less continuous decline in land holdings and a concurrent decline in the number and condition of their social institutions, such as churches, lodges, and various types of cooperative endeavor. Their greatest progress has been made in education. Among the many deficiencies in the lives and institutions of rural Virginia Negroes are illiteracy, dearth of well-trained and independent leaders, ill health, poor housing, malnutrition, weak social organizations, inequitable race relations, and political inactivity and lethargy. Serious handicaps are the soil and location, institutionalized race and class prejudice of the majority white population, and their own prejudices. Developments promising a better life include: Government activities such as improvements in tenancy, soil conservation, rural housing and electrification, and loans for farm purchases; education—research surveys, better salaries for colored teachers, and better schools; improvements in county government; and improvement of the condition of the poorer white people, which tends to bring about similar improvement in the condition of the Negroes. Whites in increasing numbers are said to desire to cooperate with Negroes in matters of common interest.

**Youth in low-income farming areas,** W. A. ANDERSON. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 3, pp. 6-7, illus. 1).—A study of youth in three low-income farm areas showed that they tend to remain in places of limited agricultural possibilities. A study of 705 children from homes in three such areas revealed that only 1 in each 10 had been reared in another county or another State. Seventy-three percent of the fathers also were reared in the areas, and only 14 percent came from other States. The average age at which the young men left home was 21 yr. Their sisters left almost 2 yr. earlier. Only 1 in each 5 sons and 1 in each 10 daughters stayed at home till they were 25 yr. old. Three out of 4 of the women were housewives, nearly half of them in farm homes. Other likely occupations were nursing, school teaching, domestic work, and semiskilled and unskilled occupations. Of the sons, 38 percent were full-time farmers, while slightly more than 60 percent followed other forms of work, chiefly semiskilled and unskilled jobs. Only 1 percent were professional workers and 2 percent business proprietors or managers. Farming as an occupation cannot absorb more than about 3 out of each 10 children reared on New York farms.

**Adjustments of Michigan farm families to war conditions,** C. R. HOFFER (*Michigan Sta. Spec. Bul.* 333 (1945), pp. 28 |-, illus. 5).—This survey of 275 farm families from three selected areas in Michigan shows that, even though there were evidences of an increase in income since the beginning of World War II, a large proportion of the families had not changed their level of living in any significant way. There was no evidence in this study that these farm families had made expenditures in any way that would retard the war effort. Some families had difficulty in obtaining medical service since the beginning of the war, and in one community slightly more than one-half of the families reported that their physician had enlisted. Rationing programs made certain adjustments necessary. The lack of customary amounts of sugar was a problem for many families. Otherwise, only a few reported difficulties as a consequence of a limited supply of commodities which were rationed. Neighborhood activities, such as exchange of work and machinery, were practiced by a high percentage of the families and, thus, an additional stabilizing factor in family life was present. Also community relationships of these

families were not disturbed. When families engaged in war-related activities, the tendency was to do so in addition to the usual amount of participation in community affairs. There were few conflicts among these families as a consequence of war conditions. More than half of the families reported increased cooperation among the various members in doing household tasks and farm work since the beginning of the war. Besides doing more farm work, a high percentage of the families participated in war-related activities such as buying war bonds, collecting scrap, and using smaller amounts of essential rationed and unrationed goods. The over-all conclusion is that the war situation as it developed in the United States during the first 2 yr. of World War II tended to strengthen rather than disrupt farm family life, notwithstanding the fact that numerous adjustments were necessary.

**Inter-relationships among farms in a community**, M. L. OTTO. (Coop. U. S. D. A.). (*Kansas Sta. Cir.* 229 (1945), pp. 32).—"In the older agricultural areas of Kansas, certain characteristics of farm communities are the result of forces which operate to bring about maturity. As a result, there is wide variation in size of farm, type of farming, tenure, age of operator, and composition of the farm family. The purpose of this study was to describe how these varying characteristics affect each other and the interfarm relationships that finally result in a rather definite pattern for the relatively mature community." "On the assumption that communities do reach maturity, these studies were planned to determine what pattern of farms exists as to size, type, and tenure, and to ascertain variations in these characteristics and their relationship to the age of operator, farm family composition, labor and feed exchanged between farms, and the custom work hired by the different operators."

The data for the study were obtained from farm surveys made in agricultural areas around Holton in Jackson County, near Frankfort in Marshall County, and in an area in southeastern Kansas including sections of several counties.

**The social implications of soil erosion: A case-study**, J. L. HYPES. (Univ. Conn.). (*Amer. Sociol. Rev.*, 10 (1945), No. 3, pp. 373-382, illus. 4).—The author discusses the social aspects of soil erosion in the Scantic River valley of Connecticut.

**Kansas rural institutions.—I, The Fort Hays branch experiment station**, F. D. FARRELL. (*Kansas Sta. Cir.* 231 (1945), pp. 18, illus. 4).—This is an evaluation of this branch station as a rural institution for regional research.

**Community forests for rural people** (U. S. Dept. Agr. Leaflet 24 [1945], pp. 8, illus. 4).—This leaflet shows how community forests may be developed through the 4-H Club work.

**Hospitals for rural people in Ohio**, A. R. MANGUS (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Monog. Bul.* 184 (1945), pp. 26+, illus. 3).—The author found from his study of available data that the current trend in Ohio points toward regional organizations of hospitals and hospital services to serve both rural and urban populations rather than toward small rural hospitals which cannot serve the hospital needs of the countryside effectively so long as they remain isolated institutions cut off from service connections with larger medical centers in the cities.

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

- **Prerequisite requirements for courses in agricultural colleges**, C. E. ALLRED and F. N. MASTERS (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 183 (1945), pp. 49+).—"The purpose of this study was to determine the prerequisite requirements, in each of the other 47 State agricultural colleges, for courses which are comparable with those offered at the University of Tennessee. Data are based on the description of courses and the curricula outlined in the latest available catalogs." The findings are presented in summary tables on agricultural economics

and rural sociology, agricultural education, agricultural engineering, agronomy—soils and crops, animal husbandry—general and poultry, dairying, and horticulture.

Digest of annual reports of State boards for vocational education to the U. S. Office of Education, Vocational Division, fiscal year ended June 30, 1944 (Washington: Fed. Security Agency, U. S. Off. Ed., *Vocat. Div.*, 1945, pp. 73+, illus. 10).—Includes sections on agricultural and home economics education.

Libraries and graduate programs, especially in the scientific fields, C. H. BROWN. (*Col. and Res. Librs.*, 6 (1945), No. 2, pp. 101–105).—According to this paper, read at a conference of Negro Land-Grant Colleges on October 24, 1944, five factors which make library service adequate for a graduate program include rigid limitation of fields, active scholars on the faculty, adequate funds, sympathetic understanding of administrators, and an adequate library staff with at least a superficial knowledge of the fields to be covered by the graduate program.

## FOODS—HUMAN NUTRITION

Effect of fertilizer and environment on the iron content of turnip greens, M. SPEIRS, W. S. ANDERSON, M. GIEGER, L. MCWHIRTER, O. A. SHEETS, R. REDER, J. B. EDMOND, E. J. LEASE, J. H. MITCHELL, G. S. FRAPS, J. WHITACRE, S. H. YARNELL, W. B. ELLIOTT, R. C. MOORE, H. H. ZIMMERLEY, L. ASCHAM, and H. L. COCHRAN (*Georgia, Mississippi, Oklahoma, South Carolina, Texas, Virginia, and Virginia Truck Stns., South. Coop. Ser. Bul.* 2 (1944), pp. 24, illus. 1).—This study, conducted as part of an experiment to determine the effect of environmental conditions and fertilizer treatments on the mineral content of turnip greens, reports the data on the iron content. Values for calcium and phosphorus were previously reported (E. S. R., 91, p. 93).

The turnip greens (Seven Top variety) were grown in the six States cooperating in the study, one group of experiments consisting of 18 nonfactorial experiments in 11 localities with samples taken from 10 replicate plots fertilized in the manner customary for each locality. The second group of experiments was composed of 29, in which the greens were grown in 19 localities with a factorial design of the fertilizer nutrients N, P, K, and Ca involving all combinations at a high and low level of each element in 2 randomized series. The same sources and amounts of these nutrients were used in each experiment. Crops grown in the same locality in successive seasons or years were not grown on the same sites. Iron determinations were conducted by the o-phenanthroline method of Saywell and Cunningham, as modified by Sheets and Ward (E. S. R., 84, p. 427), with the use of a photoelectric colorimeter. Care was taken to prevent any contamination of the samples with iron. The iron analyses for the factorial experiments were made in 3 laboratories. Referee determinations carried out for 4 factorial experiments showed that the results from the different laboratories were not significantly different.

The results, presented in detail and discussed, showed that there were wide variations in the iron content of different crops of turnip greens. Those with the highest mean iron content in the nonfactorial experiments were obtained at Blairsville, Ga., and averaged 0.59846 mg. per gram. This was over five times the amount (0.10515 mg. per gram) found in the lowest samples, which were obtained from West Point, Miss. Variations in iron content in the factorial experiments were influenced more by environmental conditions than by fertilizer treatments, of which applied N had the largest (and the most uniform) effect, that of decreasing the iron content. The influence of place was consistently greater than that of N treatment. Each of the 16 fertilizer treatments had a significant effect in one or more of the factorial experiments. The most uniform effect was that of applied N, which resulted in a decrease in iron content in 26 of 29 experiments. The

magnitude of the decrease varied considerably with place, but the effect of N was highly significant in all groups of experiments. For 28 factorial experiments, the average reduction due to applied N was approximately 20 percent of the mean iron content. The interaction treatment, NPK, showed a constant and significant negative effect in the low error group of experiments. The influence of other fertilizer treatments with significant effects varied with place. Fertilization with N significantly increased the yields in 11 factorial experiments for which yield records were made. The reduction in iron content resulting from N applications was associated with the increased yields. Variations in yield and iron content resulting from conditions associated with place of growth were not related.

"In the factorial experiments, a significant and positive correlation existed between soil organic matter and iron content. A large part, but not the whole, of the variation in the iron content of the turnip greens connected with place was the result of the influence of soil organic matter. The decrease in iron content resulting from applied N was smallest in turnip greens grown on soils low in organic matter. The iron content of the turnip greens in these experiments was not related to any of the other soil constituents for which data were available, namely pH value or exchangeable calcium, available calcium, phosphorus, or nitrogen content. Total rainfall had no effect on the iron content of turnip greens. Irrigation at one location in a relatively dry season significantly increased the iron content of turnip greens. In general, turnip greens grown in the fall contained less iron than those grown in the spring. Fertilizer treatments had less effect on iron content in the fall than in the spring. The turnip greens grown in the fall in 11 factorial experiments showed a significant positive correlation for calcium and iron content. There was no relation between the two elements in the spring crops."

**Composition of Florida-grown vegetables as affected by environment (Florida Sta. Rpt., 1944, pp. 76-77).**—This is a brief report of a study by B. E. Janes of the composition of two varieties each of cabbage, beans, and tomatoes grown under different environments in Florida representing many of the important soil types of the State and involving a range of latitude of about 500 miles. Different fertilizer levels and different climatological conditions were also represented. Data from completed analyses of ascorbic acid, carotene, and dry matter in the cabbages, beans, and tomatoes showed considerable variations in the composition of Florida vegetables. The most marked variation resulted from different growing conditions as represented by different locations. In addition to the effect of growing conditions, there was a varietal effect. Fertilizer level did not affect significantly the ascorbic acid or carotene content of the cabbage, the tomatoes, or the beans.

**Baking potatoes divide from general table stock in common salt solution, J. S. COBB (Pennsylvania Sta. Bul. 464, Sup. 2, [1945], p. 7, illus. 2).**—Neither the external appearance nor that of the internal structures (cortex, external medullary, and internal medullary) is a very good guide of the cooking quality of a potato. However, the specific gravity of potatoes, if free from disease, is a good guide to their cooking quality. The test consists in putting the washed potatoes in a solution made by dissolving 1 lb. of salt in 1 gal. of lukewarm water; all tubers that sink are probably mealy and good for boiling and baking; those that float are probably soggy or waxy and should be used for frying. This test does not indicate disease, freezing injury, or other causes of dark areas within the tubers. Frozen tubers should not be purchased, however, and those stored until spring will not be of good quality unless the storage cellar has been clean, cool ( $35^{\circ}$ - $45^{\circ}$ , F.), and damp. Stem end discoloration can be eliminated by discarding all tubers that have a small sunken area where the stem is attached.

**Digestibility and biological value of soybean protein in whole soybeans, soybean flour, and soybean milk, W. M. CAHILL, L. J. SCHROEDER, and A. H. SMITH (Jour. Nutr., 28 (1944), No. 3, pp. 209-218).**—The method used was that of Murlin

et al. (E. S. R., 87, p. 883) in which the fecal and urinary nitrogen excretion of subjects fed a special diet containing egg protein was compared with excretions following substitution of the egg protein by the test protein. The total protein level of the diet was maintained at approximately 5 percent of the total caloric intake, and the ratio of carbohydrate to fat was kept constant. Based upon the assumption that the egg protein was completely utilized and therefore had a biological value of 100 percent, the average biological value of soybean protein for maintenance in human adults was found to be 94.5 percent for cooked whole soybeans, 91.7 percent for cooked soya flour, and 95.3 percent for commercial soybean "milk." Similarly the average true digestibility of the respective proteins was found to be 90.5 percent for cooked whole soybeans, 94.0 percent for cooked soya flour, and 89.6 percent for the soybean milk.

Composition of northern California tomatoes, G. Lo Coco (*Food Res.*, 10 (1945), No. 2, pp. 114-121, illus. 3).—Assays were made on over 8,000 samples, covering the canning periods from 1937 to 1943. The tomatoes used were mainly the San Marzano (pear shaped) variety, and a relatively few samples of the small round varieties (improved Pearson, Santa Clara, Pritchard, and others) commonly used for tomato paste. The samples came from 52 different localities in California. The results showed, in general, that the higher the total solids the higher were the reducing sugars, the ascorbic acid, and the pH, and the lower the acidity. Highest solids occurred during the middle of the season, while the highest ascorbic acid content corresponded with the optimum ripeness of the fruit and was lowest in the green or overripe tomatoes.

With pear-shaped tomatoes "the average total solids ranged from 5.60 to 6.83 percent, the pH from 4.43 to 4.52, the acidity from 0.33 to 0.37 percent, the reducing sugars from 3.45 to 3.57 percent, and the ascorbic acid content averaged 31.1 mg. per 100 gm. of tomatoes." For round tomatoes "the average total solids ranged from 5.47 to 6.20 percent, the pH from 4.31 to 4.32, the acidity from 0.40 to 0.50, the reducing sugars from 3.19 to 3.34 percent, and the ascorbic acid content averaged 30.3 mg. per 100 gm. of tomatoes." The composition of tomatoes varied from season to season and from one locality to another in the same season, due to climatic conditions. Localities with a hot, dry climate had a lower average of total solids than those with a milder one.

Experiments with guavas, W. V. CRUESS, L. A. HOHL, M. A. JIMINEZ, S. NICHOLS-ROY, R. TORRES, and M. ZORILLA. (*Univ. Calif.*) (*Conner*, 100 (1945), No. 21, pp. 22-24, 38-40, several illus.).—The vitamin C content of 25 varieties of California-grown guavas studied ranged from 55 mg. per 100 gm. in the Earle variety to a maximum of 529 mg. per 100 gm. found in the Rolfs. Other well-known varieties gave the following values per 100 gm.: Hannah 117-254 mg., Hart 195-352 mg., Herradura 62-130 mg., Turnbull 152 mg., Egyptian seedling 375-399 mg., and Diaz 260 mg. There was no correlation between vitamin C content and the color of the flesh. The pulp of the cooked whole fruit (steamed 10 min.) held in freezing storage (0° F.) about 5 weeks gave slightly lower average values than the raw outer flesh. Three varieties (Rolfs, Arrons, Seedling) after freezing in sirup, storing several weeks, and thawing, showed variable losses which the authors considered as possibly due to the removal of the vitamin C from the fruit to the sirup. Tabulated results of vitamin C values of the flesh of six varieties canned in light sirup showed losses ranging from 0 to over 50 percent of the amount found in comparable raw fruit. Most of the loss is attributed to the diluting effect of the sirup.

Moisture content of the raw guavas ranged from 79.7 to 93.3 percent. Total acid (expressed as citric acid) ranged from 0.37 to 1.46 percent, with an average of about 0.55 or 0.60 percent. The pH values ranged from 3.0 to 4.29, with most commercial varieties falling between pH 3.7 and pH 4.1. Experiments in preparing

the guavas as jam, jelly, paste, or nectar, as well as for canning and freezing, are discussed, and suggestions for obtaining palatable products are given.

**Making Velva Fruit at home** (*U. S. Dept. Agr., 1945, AIS-22, pp. [8], illus. 10*).—This leaflet gives the recipe and step-by-step directions, with illustrations, for making Velva Fruit. The directions for this frozen dessert are adapted from the commercial method for home use and involve the utilization of fruit puree (from fresh or frozen fruit), sugar, lemon juice, salt, and gelatin dissolved in water for assuring a smooth mix. Velva Fruit may be frozen in a mechanical refrigerator or an ice-cream freezer, although the latter gives a more velvety frozen product.

**Cold storage studies of citrus fruits** (*Florida Sta. Rpt. 1944, pp. 67-68, illus. 2*).—In work by A. L. Stahl on the concentration of citrus juices by freezing out the water (*E. S. R., 92, p. 587*), it was determined that these concentrated juices retained their color and flavor and 85 percent of the original ascorbic acid content after 2 yr. of storage at 0° F. The reconstituted juice stayed in suspension longer than freshly extracted juice.

**Behavior of pathogenic bacteria in fermented milks**, F. L. WILSON and F. W. TANNER. (*Univ. Ill.*). (*Food Res., 10 (1945), No. 2, pp. 122-134*).—A comprehensive review of the literature on the subject (67 references) is reported. Original experiments using *Eberthella typhosa*, *Salmonella paratyphi*, *S. schottmüller*, *Shigella dysenteriae*, and *S. paradysenteriae* showed that they were destroyed more rapidly when lactic acid is added to milk than when natural fermentation occurs. The pathogenic organisms persisted longer when the acidity increased gradually, as the slow increase permitted the development of acid-tolerant strains if they were present. Commercial buttermilk had an acidity ranging from 0.6 to 0.95 percent. In naturally fermented milk this was insufficient to destroy the pathogens tested within a reasonable time. In fermented milk with acidity of 0.95 to 1.15 percent (pH 3.9 to 4.2), pathogens survived 1 day to 7 weeks; with acidity of 0.5 to 0.86 percent (pH 4.3 to 5.0), the survival time persisted from 2 to 9 weeks. The authors concluded from their experiments that because of the wide variations in acidity and possible amounts of contamination, fermented milk should be made only from high-grade milk, pasteurized by approved methods.

**Suckers** (*Michigan Sta. Folder 4 (1945), pp. [8], illus. 5*).—This folder presents tested recipes for the use of suckers, these recipes having been developed in the interest of making greater use of an abundant but less generally used fresh-water fish. Similar folders are available for lake herring (*E. S. R., 91, p. 612*) and carp (*E. S. R., 90, p. 269*).

**Proper preparation of foods speeds freezing and lightens load on unit**, J. E. NICHOLAS (*Pennsylvania Sta. Bul. 464, Sup. 2, [1945], pp. 2-3, illus. 4*).—Food products go through three definite phases in freezing, the first being that of precooling to the freezing temperature, the second the actual freezing, and the third sub-cooling to the storage temperature. The first and third phases usually occur rather rapidly and without interruption. The freezing is done more slowly since 144 B. t. u. of heat must be removed for every pound of water at freezing; the amount of latent heat removed from food products which vary in moisture content usually varies from 110-130 B. t. u. per pound. The freezing rates of fruits and vegetables are affected by the following factors: (1) Size and shape of package, with large packages freezing more slowly than small ones; (2) size and shape of product, larger products freezing more slowly than small ones; (3) the medium in which the foods are packed, vegetables freezing more rapidly in dry packs than in brine packs, and fruits packed in sugar or sirup having a lower freezing point than unsweetened fruit; (4) the amount of food being frozen simultaneously, over-loading of a freezer compartment increasing the length of time required for freezing:

and (5) amount of wrapping or packaging material, this being the most potent single factor. The freezing rate of meat depends on shape of package, compactness of wrapping, type of wrapper, location of package in the freezer, and the amount of products being frozen at the same time, but particularly the number of layers of wrapping material.

**Nutritive values of canned fruits and vegetables,** J. F. FEASTER (*Amer. Jour. Pub. Health*, 34 (1944), No. 6, pp. 593-597).—A general discussion and review of canning processes and their effect on the vitamin content of fruits and vegetables and the nutritive value of these canned products.

**Treating jar rings prevents off-flavor in canned foods,** M. C. PFUND (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 3, pp. 7, 8).—Objectionable flavors of certain home-canned foods observed in the fall of 1943 and spring of 1944 were traced to the rubber jar rings of the type available in the preceding canning season, and 23 lots representing 15 brands of these rings still available from the local market and storeroom shelves were subjected to study. The effectiveness of the treatments applied was observed by comparing the flavor of tomato and apple juices canned in jars utilizing these rings with the flavor of juices in control jars equipped with rings known to impart no noticeable flavor to the foods.

The juices judged 2 weeks to 2 mo. after canning were found to vary in flavor. The flavor scores indicated that treatment of the rings by boiling in water was not effective, but boiling 1 doz. rings for 15 min. in 1 qt. of water containing 1 tablespoon of baking soda or 1 teaspoon of soap powder, or one-half of an unwashed, unpared medium-sized potato, sliced, or about the same amount of unwashed potato parings was more effective. After treatment, all rings were well rinsed in clear, hot water. Several treatments removed partially or wholly, the source of the objectionable flavor from most rings whether red or black, but with a few rings, mostly the ones that had possessed very strong rubber- or tarlike odors, no treatment was helpful. Manufacturers have worked to overcome the difficulty, so that it was expected almost all rings for the 1945 canning season would impart little or no flavor to canned foods. Some household rings already distributed might still be on the market however and it is recommended that rings with strong odors be treated on the day before canning one or more times with one or more of the above methods.

**Growth of *Staphylococcus aureus*, *Salmonella enteritidis*, and alpha-type streptococcus experimentally inoculated into canned meat products,** M. SURGALLA and G. M. DACK (*Food Res.*, 10 (1945), No. 2, pp. 108-113, illus. 1).—“*Staphylococcus aureus*, *Salmonella enteritidis*, and alpha-type streptococci experimentally inoculated into test-tube preparations of canned roast beef, corned beef, and potted meat grew luxuriantly and survived for at least 60 days at 22° and 37° C. when loss of moisture was prevented. *Staphylococcus aureus* inoculated into cans of specially ground and untreated roast beef and corned beef at a definite point, either on the top surface or in the center of the can, spread rapidly throughout the contents of the can.”

**Bibliography on dehydration of foods, 1938-43** (*U. S. Dept. Agr., Biblio. Bul.* 6 (1945), pp. 120-+).—This bibliography, compiled in the U. S. D. A. Library, is classified to indicate articles of general nature, those dealing with equipment, and those dealing with special commodities, such as eggs, fruits and vegetables (general, fruits, vegetables), and meat. Subject and author indexes are appended.

**Dehydration of vegetables and fruits** (*Florida Sta. Rpt.* 1944, pp. 73-76).—Brief notes give the results obtained by A. L. Stahl and F. S. Jamison in dehydration trials to determine varietal suitability, as judged by quality of the dehydrated product, of cabbage, carrots, green beans, sweetpotatoes, potatoes, corn, and onions. Other factors considered briefly included freshness, quality, and maturity of the

raw material; soil types and fertilizer; preparation; blanching; sulfuring; moisture content; temperature, humidity, and air flow in the dehydrator; packaging and storage; retention of nutritive values; and reconstitution and cooking.

**Dehydration of Texas-grown snap beans, D. J. PENTZER (U. S. D. A.).** (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 5, pp. 136-137, 157).—A study of the optimum time of blanching and conditions for dehydration was undertaken. A blanching time of 10 min. in flowing steam (for No. 4-sieve snap beans) followed by dehydration in a cabinet-type drier with a high initial dry-bulb temperature of 210° F., reduced to 150° when the beans were nearly dry, gave a satisfactory final product (with an 8-percent moisture content). Dipping the blanched beans in sodium bicarbonate did not improve the color but had a softening effect. One variety (Burpee) tested for ascorbic acid gave a value of 20.1 mg. per 100 gm. dehydrated beans, and showed no loss of ascorbic acid when stored 8 mo. sealed in a glass jar at room temperature (75°-85°).

Thirteen varieties of beans, dehydrated as described, but without the bicarbonate treatment, were assayed for  $\beta$ -carotene and reconstituted and rated as to color, texture, and flavor. Good correlation between the carotene content and quality rating was observed. Highest score and carotene content (53.7 p. p. m., dry basis) was found with the Decatur, while the lowest values in color, quality, and carotene (20.6 and 20.1 p. p. m.) were noted in the Refugee and U. S. No. 5 varieties, respectively. Carotene values for the other varieties studied were, respectively, Bountiful 50.5 p. p. m., Blue Lake Stringless 46.7, Plentiful 46.6, Kentucky Wonder White 44.6, Early Blue Lake Stringless 43.5, Potomac 38.2, Tendergreen 35.7, Oregon Stringless 35.5, Fordhook Favorite 29.7, and Full Measure 25.5 p. p. m.

**The use of sulfite solutions in potato dehydration, C. J. TRESSLER, JR. (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1944), No. 4, pp. 104-105).**—Experiments carried out on whole peeled potatoes indicated that a 1- to 2-percent sodium bisulfite dip would adequately control darkening of the outer surface of the potato. Additional use of 0.2-percent bisulfite solution in the water troughs of the trimming tables was not harmful to the hands of the workers trimming the potatoes. Blanched diced potatoes were given an additional dip in a 0.1-percent bisulfite solution, and the resulting dehydrated product was light in color and free from scorch. The drying temperatures used were increased to 210° and 185° F. in the dehydrators and 145° in the finishing bins, with a cut in the dehydrator drying time from 4½ to 3½ hr. Ascorbic acid and thiamine determinations on sulfite-dipped potatoes showed good retention of ascorbic acid, and practically total loss of thiamine when the residual SO<sub>2</sub> was greater than 500 p. p. m.

**A new method of sulfuring fruit for drying, W. V. CRUESS, H. FRIAR, E. G. BALOG, and P. VAN HOLLEN. (Calif. Expt. Sta. et al.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1944), No. 4, pp. 103, 121).**—Experiments were carried out with apricots to determine whether sulfuring or resulfuring of fruit after partial drying in the sun or in a dehydrator would successfully counteract certain difficulties, namely losses of SO<sub>2</sub> which occurred during drying, or loss of juice which occurred during sulfuring of blanched peaches and apricots. Preliminary sulfur treatment in the fumes of burning sulfur for 3 hr. preceded each of the six methods tested, including one series which consisted of sun drying, dehydrating, or dehydrating after preliminary steam blanching, and another series which involved a second sulfur treatment after partial drying by one of the three methods mentioned above. Final SO<sub>2</sub> contents of over 14,000 p. p. m. were reached by this double sulfuring process. Storage tests at 90°, 100°, and 120° F. in sealed airtight jars were carried out for 5, 12, 17, and 50 days. Best keeping qualities were observed in the dehydrated apricots, as the sun-dried fruit showed much darkening of color at all temperatures. The authors conclude that "for average storage conditions resulfuring during drying

is not necessary, but for fruits to be shipped and stored under tropical temperatures, resulfuring during drying would be advantageous."

The effect of dietary protein intake on the xanthine oxidase activity of rat liver, E. B. MCQUARRIE and A. T. VENOSA (*Science*, 101 (1945), No. 2628, pp. 493-494).—"The measured xanthine oxidase activity of rat liver is decreased approximately 50 percent when the protein in the animals' diet is reduced from 25 percent to 20 percent. When the protein level is lowered to 10 percent, the measurable xanthine oxidase activity is almost (if not completely) lost."

The amino acid composition of human milk proteins, M. B. WILLIAMSON (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 47-52).—Composite human breast milk, representing approximately 500 collections from both white and Negro women, was analyzed for 18 amino acids. Methods depending upon the formation of a volatile substance were used for alanine, serine, leucine, isoleucine, threonine, and valine, while colorimetric methods were used for the other amino acids tested (tyrosine, glycine, proline, cystine, arginine, phenylalanine, methionine, and tryptophan). Purified amino acids were used as standards. The moisture, ash, and nitrogen content of casein and lactalbumin in human and cow's milk was also determined.

In a comparison of human and cow's milk diluted to 2 volumes, the analyses indicate that there was in the human milk over three times as much cystine but less methionine. On the basis of millimoles of total sulfur amino acids, there was no significant difference between the two. The diluted cow's milk was shown to contain higher percentages of valine, threonine, and histidine, while human milk was found richer in tryptophan.

Component fatty acids of early and mature human milk fat, A. R. BALDWIN and H. E. LONGENECKER (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 255-265, illus. 2).—"Total fat, phospholipid, and complete fatty acid analyses of composites of the fats of human colostrum of the first and second days, human colostrum of the third day, and mature human milk were determined. The percentage of total fat increases [from 2.2 to 3.2 percent] and the phospholipid decreases [from 0.8 to 0.06 percent, on whole milk basis] as the lactation period progresses. The amount of low molecular weight fatty acids is very small as compared to cow's milk fat analyzed in an identical manner. There is a relatively large amount of  $C_{10}$  and  $C_{12}$  acids in the colostral fats, and these acids decrease while the  $C_{14}$  and  $C_{16}$  acids increase as the postpartum period lengthens."

Effect of glycerides of hydroxy fatty acids upon growth and development, R. S. HARRIS, H. SIERNAN, and E. E. LOCKHART (*Arch. Biochem.*, 5 (1944), No. 1, pp. 63-70, illus. 1).—Tests were carried out on groups of twelve-month-old Wistar-strain albino male rats. A control purified diet supplemented with the necessary vitamins and containing 22 to 25 percent fat in the form of hydrogenated fat (Spry) was compared with one in which 0.5 to 2.5 percent of the fat was replaced by synthetic hydroxy triglycerides. The tri-dihydroxystearyl glyceride at levels of 2.2 to 2.5 percent permitted superior gain in weight per gram of food intake, due to superior growth and development and not to excess deposition of fat. Similar tests with tri-trihydroxystearyl glyceride fed at 2.2 percent level indicated that this compound had little if any capacity to influence the growth and development. Monodihydroxystearyl triglyceride fed at levels of 0.5, 1.0, and 2.0 percent exerted favorable action on the growth and development in direct proportion to the amounts fed. In each instance greater growth was achieved on a lower intake of food than the control group. The authors conclude that "hydroxy fatty acid glycerides exert a favorable effect upon the growth and development of rats on dietsaries already presumed to be adequate."

Iron in anemic rat tissues, E. M. SCOTT and R. H. MCCOY (*Arch. Biochem.*, 5 (1944), No. 3, pp. 349-355).—Total and free iron were determined, by methods

noted elsewhere (see p. 533), in serum and tissues of normal, iron-deficient (milk diet), iron-therapy, and copper-deficient rats. The iron in tissues was considered to consist of three types, i. e., blood iron, stored iron which could be used for hemoglobin synthesis, and tissue iron which was independent of the other two types and was not available for hemoglobin synthesis. Iron-deficient and iron-therapy rats were believed to have no stored iron, so from a comparison of their iron contents, the amount of blood iron present and the tissue iron could be calculated. Normal and copper-deficient rat tissues contained in addition stored iron and this could be calculated by difference. Estimates of these three functionally different types of iron in tissue were made for the total iron present. Similar calculations were applied to the free iron levels to determine the approximate percentage of tissue and stored iron that reacted with thiocyanate. The stored iron in the tissues, as it appeared from the reaction with thiocyanate, was FeOOH. As calculated from the iron turnover in the bone marrow, it is estimated that the time of formation of the red blood cell is 40-100 min. Copper deficiency had little effect on iron absorption and storage, and the red cells were only moderately hypochromic. However, copper deficient rats showed early mortality, lack of growth, and enlarged liver, and spleens.

**Nitrogen balance on a restricted caloric intake,** R. ELMAN, H. W. DAVEY, and R. KIYASU (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 3, pp. 273-277).—Healthy female dogs were given a diet (rigidly controlled by gavage feeding) which amounted to 25 or 50 calories per kilogram of body weight. The diets consisted of either 80 percent carbohydrate and 20 percent protein (as Amigen) or 80 percent protein and 20 percent carbohydrate. With the high (80 percent) carbohydrate level, only one out of two dogs maintained a positive nitrogen balance on the 50 calories per kilogram level, while both dogs showed a negative nitrogen balance on the lower caloric level. With the high-protein (80 percent) level the dogs were in marked positive nitrogen balance on both the 50 and 25 calories per kilogram diet. The authors imply from their results that, for short periods of time when part of the caloric need can be met by tissue fat and conditions require the use of a restricted ration, a better metabolic and physiologic result may be obtained when the proportion allotted to carbohydrates is reduced and that allotted to protein is increased. The practical application in surgery and modern warfare is discussed briefly.

**The effect of successive fasts on the ability of men to withstand fasting during hard work,** H. L. TAYLOR, J. BROZFK, A. HENSCHEL, O. MICKELSEN, and A. KEYS (*Amer. Jour. Physiol.*, 143 (1945), No. 1, pp. 148-155).—Four young men were fed a completely adequate diet for 3 weeks before each fast. The fasts (5) were made at 5- to 6-week intervals, and each lasted 2½ days. The total caloric deficit produced was approximately 10,000. Work was performed in an air-conditioned suite at 74°-78° F. and 50-percent relative humidity by walking on a motor-driven treadmill at 3.5 miles per hour on a 10-percent grade. Assays included pulse rate, gas analysis, blood sugar, lactate, blood acetone, urine acetone, and nitrogen. Tests were made to determine eye-hand coordination, speed of gross body movement, hand speed and coordination, and strength. Results showed significantly higher blood sugar during the second and third days on the fifth fast. The glucose tolerance test at the end of the fasting period showed a 2-hr. blood sugar level 15 percent lower in the fifth fast than in the first. Motor speed and coordination deteriorated less during the fifth fast. Reaction time and the other psychomotor tests showed improvement. The tabulated data indicated, according to the authors, that repeated exposure to the fasting state resulted in a more efficient adaptation to fasting. The mechanism by which this occurred remained obscure.

**Effects of variations in activity, food intake, and environmental temperature on weight gain in the albino rat.** J. R. BROECK (Amer. Jour. Physiol., 143 (1945), No. 1, pp. 1-5, illus. 5).—By measuring the food intake directly, estimating the work output in "activity" cages, calculating energy storage by change in body weight, and controlling body temperature changes by using a constant-temperature room, the mechanisms of energy exchange were studied. Twelve female albino rats tested continuously from 4 to 10 mo. of age and fed a diet of finely ground Purina Chow were used. The following relationships were tabulated: "There was a negative correlation between weight change and activity when food intake and environmental temperature were constant. Increasing the food intake increased body weight gain when activity and environmental temperature were constant. Weight gain was greater at 86° than at 70° F. when food intake and activity were constant."

**Metabolic acclimatization to tropical heat.** C. A. MILLS (Jour. Lab. and Clin. Med., 30 (1945), No. 4, pp. 358-359).—The author emphasizes the point that metabolic acclimatization takes place slowly (2 to 3 weeks of continuous exposure). "Animals on choline-free diets in the heat and cold show no difference during the first week, and during the first half of the second week acute hemorrhagic nephritis causes an equal number of deaths in the two environments. After the second week, however, growth in the cold goes on practically as well without as with choline in the diet, while in the heat growth is sharply affected."

**Performance in relation to environmental temperature: Reactions of normal young men to hot, humid (simulated jungle) environment.** L. W. EICHNA, W. B. BEAN, W. F. ASHE, and N. NELSON (Bul. Johns Hopkins Hosp., 76 (1945), No. 1, pp. 25-58, illus. 19).—Using as subjects 64 young adult white male (average age 22 yr.) inhabitants of a temperate climate, the authors carried out comprehensive experiments on their responses to hot, humid heat (simulated jungle) when the transition from one environment to the other was abrupt. The food consisted of the standard army garrison ration, and salt was added to all drinking water (0.1 percent), which was allowed freely or in restricted quantities during the experiment. Activity was based upon walking with a 20-lb. pack at the standard army pace of 2½ miles in 47 min. with 13-min. rest period. Two consecutive morning and three afternoon work periods were scheduled. Measurements of heart rate, blood pressure, weight, and rectal temperature were taken at the beginning and end of each work period. Water intake, urine output, and signs of distress (fatigue, headache, dizziness, nausea, etc.) were noted.

From 8 a. m. to 5 p. m. the dry-bulb temperature was maintained around 90° to 91° F., with the wet bulb temperature around 89° to 91° and the relative humidity 94 to 96 percent. During the night the dry-bulb temperature averaged between 83° and 85°, and the humidity 75 to 80 percent. Detailed charts, with a discussion of the results, are given. The authors conclude that "men adapt themselves to work in humid heat by a process of acclimatization which enables them to work more efficiently and with less risk of illness than when first exposed. The acclimatized man works with a lower heart rate, lower skin and rectal temperature, more stable blood pressure, and less discomfort than when unacclimatized. Acclimatization to heat begins with the first exposure, is achieved most rapidly and completely by progressively increased work in the heat, and is complete in 7 to 10 days. Resting in humid heat induces but little acclimatization. Physically fit men acclimatize more rapidly than unfit men and when acclimatized are capable of more efficient work. Acclimatization develops most rapidly when the original environment is warm (summer) and is retained longest when the return is into a warm climate. Strenuous work on first exposure to humid heat is not well tolerated and leads to disability which, however, need not retard nor decrease the

final acclimatization attained provided rest, water, and salt are supplied. There is a measure of cross acclimatization between hot-dry and hot-humid environments. The performance of acclimatized men in humid heat is impaired most seriously by lack of adequate water intake and lack of physical fitness. It is also affected adversely, but not so severely, by lack of rest and sleep, by added clothing and equipment, alcohol, and long periods of work. Sweating in humid heat is profuse, grossly inefficient, wastes water and salt, and is independent of the fluid intake. Replacement of the lost water and salt is essential to efficient performance. Thirst is a lagging guide to these needs.

The upper limits of heat and humidity tolerated by acclimatized men working in hot environments, W. B. BEAN, L. W. EICHNA, and W. F. ASCHE (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 4, pp. 357-358).—Data were obtained for various combinations of dry-bulb temperature (D. B. T.) between 93° and 121° F. and wet-bulb temperature (W. B. T.) of 90° and 96°. The W. B. T. is the important limiting factor in determining the ability of men to work in hot environments. Below a W. B. T. of 91° men work easily and efficiently. Between W. B. T. of 91° and 94° men can work, but with difficulty, loss of vigor and alertness, and undesirable physiologic changes. At W. B. T. of 94° and higher, less than an hour of sustained work is possible; acute disability and marked physiological changes occur. Near the upper limits sweating averaged 2.5 l. per hour, and reached 3.5 l. in some men. Physiological changes produced were essentially the same as those found in the previous experiments of Eichna et al., noted above.

Antarctic trail diet, E. E. LOCKHART (*Amer. Phil. Soc. Proc.*, 89 (1945), No. 1, pp. 235-248).—A trial ration was devised to provide a nutritionally adequate 5,000-calorie diet when supplemented with water-soluble and fat-soluble vitamin capsules. Varying proportions of the following 13 ingredients were included: Bacon, biscuit (made with whole-wheat flour and honey), butter, cocoa, oatmeal (or other cereal), dried fruits, lemon powder, chocolate or milk chocolate, milk powder, mixed nuts, salt, sugar, and pemmican. This last concentrate was made according to two different formulas, but was composed basically of the following ingredients: Dehydrated beef liver or beef, a high proportion (30 to 32 percent) of fat in the form of hydrogenated vegetable oil or beef suet, concentrated or dehydrated vegetable, prepared cereal or soybean flour, and dried milk, and with or without adding flavoring. The main points considered in adopting the diet were stability under extreme variations in temperature, compactness, ease of preparation, and general palatability. A detailed description of the rations and a discussion of the reactions of the subjects are given.

Surveys of the nutrition of populations, II-IV, J. B. YOUMANS, E. W. PATTON, W. R. SUTTON, R. KERN, and R. STEINKAMP (*Amer. Jour. Pub. Health*, 33 (1943), No. 8, pp. 955-964; 34 (1944), Nos. 4, pp. 368-378; 10, pp. 1049-1057).—These three papers continue the report of Youmans et al. (E. S. R., 89, p. 611). The recommended daily allowances of the National Research Council serve as the criteria of expression of adequacy. The protein, mineral, and vitamin intakes of the subjects are calculated from tables of food composition or estimated from values noted for foods of similar composition.

II. *The protein nutrition of a rural population in middle Tennessee.*—Case histories were taken and physical examinations carried out to determine the occurrence of edema attributable to protein deficiency or other causes. Total serum protein, globulin, and albumin were determined. Low protein intakes (under 50 gm. per day) were preponderant in the females in the 13- to 15- and over-21-yr.-age groups. Low total protein and animal protein intakes were generally more frequently encountered in the colored than in the white groups. Protein deficiency as manifested by hypoalbuminemia occurred in about 10 percent of the population.

studied. Only about 3 percent of the cases showed edema, and this could rarely be correlated with hypoproteinemia. No correlation was obtained between dietary intake of calories or protein and serum protein levels observed.

*III. The vitamin A nutrition of a rural population in middle Tennessee.*—Symptoms of vitamin A deficiency were noted through the case histories and physical examinations. Determinations of the amount of vitamin A and carotene in the blood serum were made. Dark adaptation tests measuring the rod threshold after 20 min. in complete darkness were carried out with 4.0 micromicro lamberts, considered the upper normal limit upon which calculations were based. According to the standards used, a large proportion of the population was estimated to have a deficient dietary intake of vitamin A. This low intake was not accompanied by a high incidence of symptoms or physical signs of deficiency. Dark adaptation results and blood vitamin A levels corresponded in general to the calculated dietary intakes. The reliability of the various methods used is discussed, and an explanation of some of the differences encountered is given.

*IV. The vitamin D and calcium nutrition of a rural population in middle Tennessee.*—Physical examinations involved special attention to deformities, dental development, and manifestations of tetany. Tests of blood phosphatase, phosphorus, and calcium content were made, and X-ray photographs of arm, wrist, leg, and ankle bones were taken. Vitamin D intakes in children 1 to 3 yr. of age were recorded as being under 100 International Units daily in over 80 percent of those examined (61 out of 72). Calcium intakes were low in 68 percent of the white and 87 percent of the colored subjects, with even more striking differences apparent when based on certain age and sex groups. Clinical and laboratory evidence of calcium deficiency did not substantiate the dietary studies. Evidence of rickets was found in about 25 percent of the subjects under 3 yr. of age. However, "despite some X-ray evidence of osteoporosis and an elevated phosphatase activity in a few older children and adults, instances of probable deficiency of vitamin D, or combined vitamin D and calcium, were very few among these subjects."

**Nutrition survey of an entire rural county in North Carolina.** D. F. MILAM and R. K. ANDERSON (*South. Med. Jour.*, 37 (1944), No. 11, pp. 597-605).—Following the procedures and technics previously used (E. S. R., 89, p. 766) with the single addition of slit-lamp biomicroscopic examination, a more extensive survey was carried out on 900 individuals (120 white and 80 colored families) statistically selected to represent a cross section of the rural population. Results, in general, paralleled those of the previous study. Low vitamin C intakes were noted, and plasma levels of less than 0.6 mg. per 100 cc. were found in 55 percent of the subjects. However, no scurvy could be diagnosed. Vitamin A intake studies showed that 34.4 percent or more of the subjects were obtaining 5,000 International Units daily, and plasma levels tended to parallel the dietary intake. Thiamine, riboflavin, calcium, and iron intakes were low, averaging 0.9 mg., 0.9 mg., 0.51 gm., and 8.3 mg. daily, respectively, for colored and 1.1 mg., 1.1 mg., 0.61 gm., and 9.7 mg. daily for white subjects. The daily intake of calories averaged consistently under 2000. Protein intakes ran somewhat low (50.6 gm. and 57.6 gm. per day for colored and white, respectively), but plasma protein levels averaged above 7.0 gm. per 100 cc. in both groups. The authors state that "one cannot avoid the suggestion that there exists a broad zone below the present National Research Council levels of recommended dietary allowances in which individuals can adjust themselves with no patent signs of deficiency resulting. . . . Findings indicate that dietary deficiencies are general and not due to lack of one or a few of the essential nutrients."

**A nutrition study of West Virginia students.** H. C. CAMERON (*West Virginia Sta. Bul.* 318 (1945), pp. [8]).—One hundred first-year students, equally divided

between men and women, were selected for study in the fall terms of 1939-40 and 1940-41, the selection being at random as the students passed through the examining line of the student health center. Blood samples taken by venipuncture and treated with a definite amount of potassium oxalate were utilized for: (1) Hemoglobin determinations, made by reading a 1:400 aqueous dilution in a Kuder photoelectric colorimeter and comparing the reading with a standard curve previously established from such readings on bloods from 10 normal subjects plotted against respective blood-iron determinations; (2) red blood cell counts made in duplicate or quadruplicate with standard blood-counting pipettes checked against a certified pipette, using freshly filtered normal saline as a diluent; and (3) hematocrit determinations, using Wintrobe hematocrit tubes centrifuged for  $\frac{1}{2}$  hr. at 3,000 r. p. m. to establish the proportion of cells to plasma. Blood counts and hemoglobin determinations were repeated in the winter or spring. In addition vitamin A reserve was measured by means of a visual photometer in a dark room, although the limitation of this instrument in detecting mild degrees of vitamin A deficiency was recognized.

The results, summarized and discussed, showed the average figures for red cell count, hemoglobin, and hematocrit as determined in the fall to be normal for both men and women, with values for the majority of the students falling within the normal range. However, from one-third to two-thirds showed improved values when tested again in the winter. This improvement, considered more significant than the average values found, suggested that eating habits had been improved, or that better-balanced diets were being eaten. Bioplotometer readings as an indication of vitamin A reserves gave low or borderline values for 11.7 percent of the men and 5 percent of the women in the first year; normal values were observed in all students in two succeeding years. Food histories obtained from the students showed that of the iron-rich foods which might contribute to improved hemoglobin values liver was the most unpopular. Twenty-five percent of the students expressed a dislike for it, while only 10 percent disliked spinach and prunes. Eggs were well eaten by men, but were refused by 6 to 13 percent of the women. Bread, about one-third of which was whole wheat, was eaten in considerable quantity, the average being seven to eight slices daily for men and five for women. The average milk consumption was three glasses daily for the men and slightly over two for the women. From 75 to 90 percent of the men, and 50 to 60 percent of the women, drank two or more glasses daily.

A study of the nutritional status of a population group in Mexico City, W. D. ROBINSON, G. C. PAYNE, and J. CALVO (DE LA TORRE) (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 5, pp. 289-297).—In this study of food habits and nutritional status, a selection was made of 463 people (88 families) representative of 2 percent of the district population on a basis of geographical density and age distribution. Dietary records were made by the inventory and purchase method supplemented with individual consumption records. Tables used in calculating the dietary intake of vitamins and the proximate composition of the food were from English and American sources, with some allowance made for losses in cooking. Clinical tests included slit-lamp and biomicroscopic examination of the cornea, examination of the bulbar conjunctiva, gums, and tongue, and a general medical history and diagnosis. Laboratory determinations included tests for hemoglobin, red blood cell count, hematocrit values, total serum protein, ascorbic acid, carotene and Vitamin A, and in addition serum phosphorus and phosphatase in children under 5.

The basic foods used were mainly corn, beans, and chili peppers, supplemented by an abundance of other foods purchased in amounts which corresponded roughly to the family income. It is pointed out that in Mexico corn is stored as the

whole kernel and the amount needed daily is placed in water with crude lime, heated 20 to 30 min. at 80° C. and allowed to soak overnight, then washed<sup>1</sup> several times and wet-ground into a puttylike dough called "masa," and made into tortillas. Analysis for Ca indicated a high retention, while no data were available on the effect of this treatment upon the B vitamins, especially thiamine. Data were tabulated by age groups and sex, and compared in terms of recommended daily allowances (r. d. a.), using Bigwood's consumption coefficients (E. S. R., 82, p. 416). The information collected indicated in general that whereas very few of the people studied received an ideal diet (in terms of r. d. a.), the incidence of detectable clinical evidence of malnutrition was very low.

Results showed that phosphorus, iron, and calcium intakes averaged above the r. d. a. with one exception (calcium in infants). Protein intake was good except when the r. d. a. was 80 gm. per day or higher (as in adolescence, pregnancy, and lactation). On the whole, lowest vitamin intakes (in terms of r. d. a.) were also predominant in these special groups. The author concludes that a comprehensive program of food analysis along with dietary surveys and consumption-habits studies is necessary to interpret the results more clearly.

The adequacy of diets of 38 Honolulu families on relief, M. POKIETTER (*Hawaii Sta. Bul.* 94 (1944), pp. 39, illus. 4).—This report of the food consumption habits and nutritional adequacy of the diets of 38 relief families, selected as willing and able to cooperate, is based on a survey conducted between June and December 1940 in which each family kept a 4-week record of all foods consumed. Calories, protein, calcium, phosphorus, iron, vitamin A, thiamine, and ascorbic acid furnished by each family's diet were calculated and compared with the standards for these nutrients recommended by Stiebeling and Phipard (E. S. R., 81, p. 142).

On this basis, not one family diet was completely adequate; three-fourths of the diets were deficient in five or more dietary essentials and over half of them in seven or eight. The greatest deficiencies were in calcium and thiamine, 95 percent of the family diets being deficient in calcium, with an average deficiency of 47 percent, and 92 percent deficient in thiamine, with an average deficiency of 44 percent.

The total cost of the family diets averaged 5 percent above the amount required for a minimum-cost adequate diet in Honolulu at the time of the study, but faulty choice of foods resulted in dietary inadequacy. About half of the families were not spending enough money to secure nutritionally adequate diets, although their relief grants made allowance for adequate food budgets.

Dental data were obtained on 90 of the 129 school children in these 38 families. All were found to have dental caries with an average of 9.2 decayed teeth per child.

Certain errors in food purchasing by the families are pointed out, and suggestions are offered for obtaining a more adequate family diet on a limited food budget. A prefatory note to the bulletin points out that some of the many wartime changes in Hawaii's food supply since July 1941 will make it more difficult for families on relief to obtain an adequate diet.

A nutrition survey in East York Township, I-III (*Canad. Jour. Pub. Health*, 34 (1943), No. 5, pp. 193-204; 35 (1944), Nos. 2, pp. 66-70; 6, pp. 241-245).—

I. Description of survey and general statement of results, E. Riggs, H. Perry, J. M. Patterson, J. Leeson, W. Mosley, and E. W. McHenry.—The survey was conducted with 546 adolescents (aged 11 to 19 yr.) largely from middle-class Anglo-Saxon families. Dietary records of all foods and beverages consumed over a period of 1 week were kept. Medical histories were taken and dental and physical examinations made. Tests for vitamin deficiencies included slit-lamp examination, dark adaptation, and capillary fragility measurements. The nutritive value of the diet was calculated (on a raw basis) from food composition tables. Adequacy of the diet was expressed in percentage of recommended daily allowances of the National

Research Council. On this basis, 56 to 75 percent of the subjects showed inadequate consumptions of thiamine and ascorbic acid, respectively, while 25 percent showed poor calcium intake. Appraisal of the nutritional status and health by physical examination indicated approximately 80 percent of the subjects to be in good or excellent condition. No correlation could be found between poor dietary intakes of food constituents and physical findings. Dental caries (prevalent throughout the group) showed no correlation with either calcium or vitamin D intake. Similarly, vascularization of the cornea (supposedly associated with riboflavin deficiency) occurred, if anything, more frequently in those subject with adequate riboflavin intake. The authors conclude that either the methods of securing dietary records and interpreting them were inadequate, the dietary records did not give a reliable assessment of nutritional conditions, or the standards of comparison (recommended dietary allowances) were too high.

II. *The influence of the choice of dietary standards upon interpretation of data*, H. P. Ferguson, H. J. Leeson, and E. W. McHenry.—In an attempt to obtain better agreement between physical findings and estimated adequacy of dietary intake, as applied to thiamine and ascorbic acid, new standards were selected. The authors adopted a thiamine level of 0.23 mg. per 1,000 calories as optimal. Their basis was the report of Keys et al. (E. S. R., 92, p. 149), which indicated that no differences were apparent in the clinical or metabolic picture between this level of intake and amounts up to 0.63 mg. per 1,000 calories. The ascorbic acid standard was set at 30 mg. per day, corresponding to a value recommended by the League of Nations and widely accepted in Great Britain. In regrading the nutritional status of the subjects, the previous standards (National Research Council recommended daily allowances) were used for calories, protein, calcium, iron, vitamin A, and riboflavin, while these new values for thiamine and ascorbic acid were substituted. On this basis 71 percent of the girls and 72.3 of the boys examined had excellent or good nutritional status and food supplies. Corresponding figures from the previous grading were—girls, 56.2 percent and boys 57.2 percent. The authors concluded that “no proof is available that the standards used in the recalculation are more reliable than the recommended allowances, but their use has made the two sets of data more consistent.”

III. *Repetition of dietary studies after two years*, H. P. Ferguson and E. W. McHenry.—Seventy-five students who had participated in the previous experiment were reexamined. No deleterious effects due to changes brought about by food rationing could be found. Evaluation of the diets in terms of recommended daily allowances by age and sex indicated notable improvement, especially in ascorbic acid intake. The boys also showed marked increase in calories and other nutrients consumed. The improvements noted were considered by the authors to be due to educational efforts and to a bettering of economic conditions.

Studies in dark adaptation in the detection of deficiency of vitamin A, J. YUDKIN (*Roy. Soc. Med. [London], Proc.*, 38 (1945), No. 4, pp. 162-164, illus. 1).—Applying the results of previous experiments of Robertson and Yudkin (E. S. R., 93, p. 226) and Yudkin et al. (E. S. R., 93, p. 516), the author has attempted to determine the probable vitamin A status of different groups, possessing no pathological conditions other than dietary deficiency, by measuring their dark adaptation. Groups of similar age were studied or allowance was made for age. Exceptions to the criteria used caused the author to suggest that evidence of poor dark adaptation alone was a less important criterion than if it is combined with evidence of improvement following administration of the vitamin.

Periodic fluctuations in the dark adapted threshold, R. H. LEE, E. M. FINCH, and G. A. POUNDS (*Amer. Jour. Physiol.*, 143 (1945), No. 1, pp. 6-10, illus. 2).—Tests on a number of human subjects have shown that “these fluctuations are

especially noticeable in the terminal threshold. They have periods and amplitudes of the correct order of magnitude to explain the existence of the 'frequency of seeing' curves. However, the periods of the fluctuations are too long to be satisfied by either the quantum or the more vague instantaneous probability hypotheses. They are observed in each eye independently, and the two eyes can be in phase or out of phase. Binocular thresholds exhibit variations in amplitude of fluctuation such as would be produced by interaction between two loosely coupled oscillating systems having slightly different periods."

[Vitamin A and C activity of Florida foods] (*Florida Sta. Rpt.* 1944, pp. 61-62)—Data by R. B. French and O. D. Abbott are reported for the carotene and ascorbic acid contents of bullock's-heart (*Annona reticulata* L.), jujube (*Zizyphus mauritiana* Lam.), guavas (3 varieties), mangoes (13 varieties), tomatoes (10 varieties), and green and bleached celery (outer and inner stalks, hearts, leaves).

The effect of canning processes on the carotenoids and vitamin C content of peaches, (*South Carolina Sta. Rpt.* 1944, pp. 67, 69-70).—In this study by J. H. Mitchell, L. O. Van Blaricom, and D. B. Roderick, 12 varieties of peaches, selected primarily because of their promise as canning varieties, were analyzed the day they were canned for total carotenoids and ascorbic acid. Analyses were made of the fresh fruit and of peaches after they had passed through the lye bath and the wash water. The sampling was done at the cannery, where blended mixtures were prepared for analyses with the Waring blender using 1 percent metaphosphoric acid for the ascorbic acid blend and a mixture of 50 cc. of alcohol and 70 cc. of hexane for the carotenoid blend. Carotenoids varied in the different varieties from 1.19 to 1.69 mg. per 100 gm. fresh unpeeled sample; losses due to peeling in the hot lye bath varied from 1.68 to 27.97 percent and averaged 10.7 percent in the different varieties. Ascorbic acid in the varieties ranged from 4.03 to 9.60 mg. per 100 gm., and the peeling losses ranged from 3.07 to 33.80 percent. Analyses of peeled peaches, taken from the cans (packed 22 oz. to the can) immediately before the sirup was added, and of the canned peaches (total contents blended) showed a fairly uniform loss of carotenoids, averaging about 52 percent. Ascorbic acid loss was variable but averaged only about 9 percent.

Vitamin A potency of Idaho butter, D. R. THEOPHILUS, O. E. STAMBERG, D. W. BOLIN, and H. C. HANSEN (*Idaho Sta. Cir.* 102 (1945), pp. [4], illus. 1).—This investigation, conducted as part of a national cooperative study on the vitamin A potency of butter, employed the chemical methods for vitamin A and carotene recommended by the technical committee appointed to consider the vitamin methodology for this cooperative project. The method developed for vitamin A was essentially that of Carr and Price using antimony trichloride; carotene was extracted with petroleum ether and other pigments removed by 92 percent methyl alcohol. For checking the methods, periodic tests were made on referee samples provided by the committee. "Results presented for vitamin A are corrected for a 93-percent recovery of vitamin A in analysis in accordance with suggestions made by the technical committee. International Units of vitamin A were calculated on the basis of 0.25 µg. of carotene being equivalent to 1.0 I. U.

"Results of a year's study on the vitamin A potency of butter from creameries in the main producing areas of Idaho showed relatively small differences in the vitamin A potency of butter from the different areas. The weighted average of all areas showed a low of 12,499 I. U. of vitamin A potency per pound of butter in February and a high of 19,281 I. U. in October, with July having an average of 19,040. . . . Although both the vitamin A and carotene content were lowest during the winter months, the vitamin A content was less variable than the carotene content. Since the cow normally obtains vitamin A in the form of carotene from feeds, it is necessary for the cow to consume feeds high in carotene in order to secrete milk

which will produce butter high in vitamin A potency. Therefore, if a uniformly high level of vitamin A potency is desired in butter produced in Idaho, it is obvious that during the winter and off-pasture months the feeding of high quality, properly cured green leafy alfalfa hay or other feeds high in carotene is necessary."

**Apparent increase in carotene of carrots during process of dehydration,** G. F. BAILEY and H. J. DUTTON. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 5, pp. 138, 142, 155).—Laboratory experiments carried out on 50-gm. samples of carrots were carefully controlled so as to determine the percentage of solids removed during the steam and water blanching process prior to dehydration. These tests indicated that the higher carotene values found in the dehydrated samples corresponded closely to the theoretical values calculated from the percentage of solids lost in the leaching. The authors point out that the observed increase in carotene in dehydrated carrots is not a function of systematic error in the carotene determination but rather a direct result of the loss of soluble solids.

**The nutritive value of Fusaria,** L. J. VINSON, L. R. CERECEDO, R. P. MULL, and F. F. NORD (*Science*, 101 (1945), No. 2624, pp. 388-389).—Using two strains of the genus *Fusarium*, viz *F. lini* Bolley (FIB) and *F. graminicarum* Schwabe (Fgra), the authors attempted to replace brewers' yeast as a source of B-vitamins in a purified diet for mice. Fgra at a 10-percent level proved totally inadequate, lacking several of the B-vitamins, while FIB proved an excellent source of growth (at a 10-percent level) over a period of 30-35 days, being superior to brewers' yeast during the same time interval. However, after 1 mo. on the FIB diet, the mice showed a loss of weight and appetite which was overcome by the addition of thiamine (10 µg. daily). An effect comparable to the injection of thiamine was obtained when the amount of FIB in the diet was doubled. Further experiments showed that, at a 10-percent level, FIB, when supplemented with thiamine, provided a source of B-vitamins adequate for growth, reproduction, and lactation in mice fed a purified diet. The authors point out that the utilization of FIB as a food constituent is particularly noteworthy, as it and related molds can be easily grown in the course of the alcoholic fermentation of hexoses and pentoses present in such byproducts as wheat stillage, sulfite waste liquors, and pretreated wood hydrolyzates.

**Nutritive value of canned and dehydrated meat and meat products,** E. E. RICE and H. E. ROBINSON (*Amer. Jour. Pub. Health*, 34 (1944), No. 6, pp. 587-592).—Summarizing the recent data presented by Poling et al. (E. S. R., 92, p. 435), McIntire et al. (E. S. R., 90, p. 565), and Reedman and Buckley [Buckby] (E. S. R., 91, p. 620), the authors show that there is little loss of niacin and riboflavin in the cooking, canning, or dehydration of meats. Pantothenic acid may decrease nearly 30 percent and thiamine destruction may amount to 60 percent, depending upon the time and temperature required to process the canned product. Experiments on the retention of vitamins in canned and dehydrated pork stored for variable lengths of time at temperatures ranging from -20° F. to +145° showed that during storage of either canned pork, dehydrated pork, or dehydrated beef at temperatures up to 99° there was little or no loss of niacin, riboflavin, or pantothenic acid. Thiamine decreased more rapidly, showing some loss at 80°. After 293 days' storage the thiamine retention in canned pork was 52 percent. In dehydrated pork the retention was poorer, being 29 percent after 219 days at 80°. At higher temperatures there was almost complete destruction of thiamine in both products.

**Biotin in fermentation, respiration, growth, and nitrogen assimilation by yeast,** R. J. WINZLER, D. BURK, and V. DU VIGNEAUD (*Arch. Biochem.*, 5 (1944), No. 1, pp. 25-47, illus. 5).—Employing the yeast *Saccharomyces cerevisiae* Fleischmann strain 139, which requires biotin for normal growth, the authors have carried

out detailed experiments to determine the "biotin effect" obtained in the presence or absence of various substances. The term biotin effect is applied to the increased rate of fermentation (or respiration, growth, etc.), which requires some time, usually hours, for full development. It is not applicable to any stimulated rate established completely and immediately, within a few minutes at most. According to a summary of the results obtained "biotin-deficient yeast was found to respire and ferment at rates one-tenth to one-twentieth of those of normal biotin-rich yeast. Upon the addition of biotin, in the presence of ammonia, but not in its absence these metabolic rates rise gradually, fermentation first, then respiration, and finally growth. With yeast only partly deficient in biotin, added biotin may cause an immediate increase in fermentation rate, even without added ammonia, but this increase is not a function of time..."

"Other nitrogen sources, particularly asparagine, arginine, and urea, may substitute for ammonia but are far less effective. Leucine and glycine cannot substitute for ammonia in its effect on the action of biotin on metabolism. Low concentrations of azide and cyanide can, without affecting the initial fermentation rate, prevent the increase in the rate of fermentation elicited by biotin and ammonia. Azide also inhibits the utilization of ammonia by yeast. . . . Biotin was neither synthesized nor destroyed by growing yeast. The biotin content of yeast, when grown at different biotin levels varied from 0.017γ to 13.9γ per gram. Biotin-deficient yeast rapidly takes up from solution its normal complement of biotin. This biotin uptake is markedly decreased in the absence of glucose or phosphate, and appears to involve synthetic processes. No ammonia was taken up by biotin-deficient yeast unless biotin was present. Ammonia uptake by normal and biotin-deficient yeast was almost completely inhibited by lack of glucose or phosphate, and by the presence of  $10^{-4}$  M azide. The Meyerhof oxidation quotients of biotin-deficient yeast range from 10 to 20 compared to usual values of 3 to 6 or less. The significance of this in relation to the Pasteur effect is discussed."

Observations upon the creatine content of the muscles of normal, biotin-injected, and biotin-deficient rats, P. PIZZOLATO and H. H. BEARD (*Arch. Biochem.*, 6 (1945), No. 2, pp. 225-229).—In these experiments the authors employed a biotin-deficient diet and a technic practically identical with that described by Nielsen and Elvehjem (E. S. R., 89, p. 505) but used a different normal control diet composed of Purina Dog Checkers. Under these conditions the muscle creatine of rats was found to decrease an average of 27 percent over the 136-day period used, with the decrease, in general, proportional to the loss in body weight and severity of the histological symptoms and biotin deficiency. Biotin was considered necessary to maintain the normal creatine level in the muscles. Contrary to the results of Nielsen and Elvehjem, it was found that the administration of biotin (2.5γ injected daily for 3 days) had no effect upon the animals fed the control diet. In these tests, employing 10 animals in each group, the muscle creatine was found to average 0.44 percent for controls and 0.43 percent for those receiving the injected biotin.

Identification of folic acid as one of the unknown dietary essentials for guinea pigs, D. W. WOOLLEY and H. SPRINCE (*Jour. Biol. Chem.*, 153 (1944), No. 2, pp. 687-688).—Employing the basal ration found satisfactory in the recognition of three new dietary essentials for guinea pigs by Woolley (E. S. R., 88, p. 705), the authors have tested out certain fractions rich in folic acid, concentrates of folic acid, and finally crystalline folic acid itself. They concluded from these experiments that their factor GPF-1 is identical with folic acid. A solubilized liver extract (Wilson's Fraction L) in a lead-acetate-norite preparation seems to be a concentrate of the new dietary essential GPF-3.

The effect of nicotinic acid and nicotinamide on growth, liver fat, renal hemorrhages, and excretion of "Trigonelline" in the rat, P. P. and N. L. FOA

and H. FIELD, JR. (*Arch. Biochem.*, 6 (1945), No. 2, pp. 215-224, illus. 1).—Young male rats were fed a basal diet containing variable levels of casein (5 and 18 percent) and supplemented with nicotinic acid, nicotinamide, and choline, either separately or in combination. Since preliminary results showed wide variations within the same group and considerable overlapping of values from different groups, a second series was run using litter mates and pair-fed animals. "Nicotinic acid, nicotinamide, and choline have no specific action on the growth of young rats. Nicotinic acid and nicotinamide inhibit the growth of the animal only because food intake is inhibited by these supplements. Choline did not prevent growth impairment from nicotinic acid or nicotinamide, when the food intake was controlled. When the food intake is controlled no difference exists between the rate of growth of animals receiving nicotinic acid, nicotinamide, or choline, and that of their pair-mates. Nicotinic acid and nicotinamide equally increases the fatty infiltration of the liver and the severity of the hemorrhagic degeneration of the kidneys. This action is prevented by choline. Rats excrete more trigonelline when they receive supplements of nicotinamide than when nicotinic acid is fed. Choline added to a diet containing nicotinic acid or nicotinamide produces a further increase in the urinary excretion of trigonelline. It is believed that nicotinic acid and nicotinamide obtain methyl groups from choline for the production of methylated derivatives."

The rôle of pantothenic acid in the synthesis of tryptophane, M. G. SEVAG and M. N. GREEN (*Jour. Biol. Chem.*, 154 (1944), No. 3, pp. 719-720).—Experiments on the growth of *Staphylococcus aureus* on synthetic or casein hydrolyzate media showed that, in the absence of added tryptophan, pantothenic acid plus glucose was required to obtain growth (turbidity reading = 49). With the addition of tryptophan to the synthetic medium, turbidity readings of 52 to 60 were obtained with no appreciable difference in the results with or without glucose and/or pantothenic acid. "It is concluded that pantothenic acid mediates the metabolism of glucose leading to or involved in the synthesis of tryptophan and thereby of the growth of staphylococci."

Studies on the metabolism of pantothenic acid and *p*-aminobenzoic acid, B. LUSTIG, A. R. GOLDFARB, and B. GERSTL (*Arch. Biochem.*, 5 (1944), No. 1, pp. 59-62).—An attempt was made to study the metabolism of pantothenic acid and *p*-aminobenzoic acid in mice through the use of preparations of these vitamins containing isotope  $N^{14}$ . Analysis of the skin, organs, carcass, and excreta plus excess food showed no storage or utilization of the labeled  $N^{14}$  of *p*-aminobenzoic acid. The authors conclude that "rapid excretion by animals depleted of pantothenic acid follows its parenteral administration. Its almost complete absence in various organs indicates that the nitrogen of pantothenic acid, unlike that of amino acids, is not utilized by the organism. No storage of pantothenic acid in mice can be assumed."

The vitamin activities of "pyridoxal" and "pyridoxamine," E. E. SNELL (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 313-314).—The author demonstrated that the chemical compounds called pyridoxal and pyridoxamine, as synthesized by Harris et al. (p. 535), exhibited high pyridoxine activity when tested with *Streptococcus lactis* R and *Lactobacillus casei*, while having no effect upon the growth of *Saccharomyces carlsbergensis*. It is suggested that these two compounds or their higher combinations might be responsible for the "pseudopyridoxine" activity reported for certain natural materials.

The vitamin P activity of black currants, A. POLLARD (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 5, pp. 139-142).—Attempts to isolate and purify vitamin P from concentrated black-currant juice are briefly described. A concentrated product having a high vitamin P potency (over 100 times that of hesperidin) was obtained by alcohol-ether extraction of spray-dried black-currant juice. The final material contained about 80 percent of the original activity and amounted to

0.04 percent by weight of the original black currants. The physiologically active fraction gave a positive cyanidin reaction, a green color with ferric chloride, and a yellow color with boric acid or alkali. Crystalline material obtained by acetylation and adsorption was inactive. Adsorption spectra measurements of the various fractions prepared are tabulated and compared with other compounds thought to have vitamin P activity. A brief discussion as to the nature of the active substances in various compounds with vitamin P activity and the method of estimating this activity is included.

**Retention of thiamine, riboflavin, and niacin in deep fat cooking,** G. J. EVERSON and A. H. SMITH (*Science, 101* (1945), No. 2622, pp. 338-339).—Doughnuts made in a commercial machine were ejected into hot fat (approximately 375° F.); half the doughnut was immersed in the cooking fat for 45 sec. then the doughnut was turned mechanically, and for the rest of the 90 seconds' total cooking time the other half was immersed. The doughnuts were made from enriched flour and the batter had a pH of 6.1. Comparison of the dry doughnut mix and the freshly cooked doughnut (making allowance for the addition of water in preparing the dough and for the fat absorbed during frying) indicated an average loss in cooking of 22.9 percent for thiamine and 20 percent for niacin. No measurable loss of riboflavin or iron was noted. The composition of the finished doughnuts (30 gm. each) was as follows: Calories 123.6, moisture 6.84 gm., protein 1.84 gm., fat 6.03 gm., carbohydrate 14.70 gm., calcium 13.40 mg., phosphorus 92.70 mg., iron 0.57 mg., thiamine 0.085 mg., riboflavin 0.066 mg., and niacin 0.600.

**Effect of methods of cooking fresh and cured pork, and of canning fresh pork, on the thiamin and niacin content** (*Kentucky Sta. Rpt. 1944*, pp. 48-50).—In continuance of this work (E. S. R., 91, p. 777), thiamine and niacin were determined in loin ham, shoulder, spareribs, and liver from four additional hogs raised during fall and winter under uniform conditions. The values differed somewhat from those obtained earlier for the four hogs raised during the previous spring and fall, but the two sets of data were of the same order of magnitude (calculated on the dry basis). Paired right and left hams and shoulders were used to obtain comparative data on fresh and cured meat, the cured cuts being analyzed after 3½ mo. The results indicated that curing had destroyed 36-42 percent of the thiamine and 37-43 percent of the niacin. Roasting, frying, and boiling caused some further destruction of the thiamine; boiling caused less loss than the other two methods. Destruction of niacin upon cooking the cured pork was appreciably less than that of thiamine. Canning of fresh, lean pork loin, ham, shoulder, and liver with the addition of fat but no water (except with liver) caused a loss of 74-82 percent of the thiamine and 0-16 percent of the niacin.

**Location of thiamin and riboflavin in wheat grains,** G. F. SOMERS and M. H. COOLIDGE. (U. S. D. A.). (*Science, 101* (1945), No. 2613, pp. 98-99)—A technic is briefly described which demonstrates in the wheat grain the fluorescence produced when thiamine and riboflavin are treated with alkaline ferricyanide. The application is made to 20-μ slices cut from wheat grains, and the resulting intensities of fluorescence obtained are interpreted as corresponding to the concentrations, in different portions of the grain, of the vitamins studied. The authors consider this technic to be useful in studying the role and distribution of the vitamin in the grain and helpful in facilitating selection of special strains of wheat.

**Reaction rates for decomposition of thiamin in pork at various cooking temperatures,** E. E. RICE and J. F. BEUK (*Food Res., 10* (1945), No. 2, pp. 99-107, illus. 3).—Experiments to determine the rate of loss of thiamine from lean pork muscle during heating were carried out on 5-gm. portions of well-mixed ground lean pork, in ½-inch screw-cap tubes. Temperatures of 49°, 54°, 63°, 71°,

77°, 82°, 93°, 99° and 121° C. for varying lengths of time were studied. Tabulations and statistical analyses of the results obtained are given. The results indicated that under the experimental conditions used the rate of loss of thiamine (at temperatures above 77°) is constant at any given temperature, and proportional to the temperature. Below 77° the rate of loss decreases during the first 16-24 hr. and then apparently remains constant thereafter. At this lower temperature range, the rates of loss are proportional to the temperature. A discussion and possible interpretation of the kinetics of the reactions are given.

The role of fecal thiamine and cocarboxylase in human nutrition, B. ALEXANDER and G. LANDWEHR (*Science*, 101 (1945), No. 2618, pp. 229-230).—Assays of human fecal thiamine and cocarboxylase indicated that the feces contained more of these substances than any tissue of the body. Less than 50 percent of the thiamine was retained in the filtrate when a water suspension of feces was run through a Scitz filter. No increase in urinary excretion of thiamine was found when a retention enema, containing twice the amount of free and phosphorylated thiamine in the average 24-hr. stool, was administered and retained 24 hr. All the administered thiamine and cocarboxylase was recovered as such in the next 24-hr. stool. The authors conclude from these experiments that the thiamine and cocarboxylase in human feces is of no nutritional value to the individual, since it appears to exist largely in the bodies of bacteria and other organisms in the feces.

Vitamin C content of lima beans, (*South Carolina Sta. Rpt.* 1944, pp. 67, 68).—In this study by J. H. Mitchell and D. B. Roderick, Henderson Bush lima beans, harvested at early, medium, and late maturity (10 to 14 days between harvests), and Carolina Sieva pole lima beans, harvested at early and medium maturity, were analyzed for ascorbic acid. Although each single harvest included immature, mature, and over mature pods, the results of analyses (expressed as milligrams ascorbic acid per gram, dry basis) indicated certain maturity trends, the beans obtained at the earliest harvest having the highest ascorbic acid content. There was little difference in the total ascorbic acid content of the two varieties of beans. Beans stored in the pod retained their vitamin value much better than the shelled beans, although the latter, if stored in the refrigerator in a closed container, did not show so great a loss of ascorbic acid. Beans cooked 30 min., about the shortest time required for them to become palatable, lost 15 to 20 percent of their ascorbic acid; after 3 hours' cooking there was a loss of 35 to 45 percent. Mature beans lost more ascorbic acid in cooking than did the immature beans.

Vitamin C in wild roses, S. P. RUDNYKII (*Food*, 13 (1944), No. 159, p. 316).—Wild roses grown in Soviet Transcaucasia or Armenia were found to contain high levels of vitamin C in their fruit, when assayed by the classical dye-titration method of Tillmans. Regional as well as varietal differences seemed to account for the values obtained. Species of roses grown in the Armenian highlands (*R[osa] boissieri*, *R. afzeliana*, *R. tomentosa*, *R. caryophyllacea*, and *R. pulverulenta*) contained from 1,233 to 3,258 mg. ascorbic acid per 100 gm., while those roses grown in other regions (*R. tomentella*, *R. canina*, *R. corymbifera*, and *R. iberica*) showed values ranging from 563 to 699 mg. per 100 gm.

The author found that the vitamin C content increased with the distance above sea level, and seemed to vary with the shape and color of the calyx leaves. Those plants having fleshy, colored, and upright calyx leaves during the early stages of the maturation of the fruit showed the highest vitamin C values.

## TEXTILES AND CLOTHING

Testing fabrics for resistance to mildew and rot, P. B. MARSH, G. A. GREATHOUSE, M. L. BUTLER, and K. BOLLENBACHER (*U. S. Dept. Agr., Tech. Bul.* 892 (1945), pp. 22, illus. 2).—The simple apparatus described (and illustrated by diagram) for subjecting fabric treated with mildew preventives to water leaching consists of a constant temperature, constant level water bath from which water passes at a constant rate to a battery of leaching vessels (1 qt. mason jars) fitted with wire-mesh cylinders for supporting the fabric during leaching, and equipped with glass siphons, connecting rubber tubes, and small glass capillaries. The capillary dimensions and the head of water determine the rate of water flow through the siphons.

Several fungi were found capable of tendering treated fabric of higher copper content than that attacked in similar tests by the common test organisms *Chaetomium globosum* and *Metarrhizium* sp. The evidence presented suggests that the copper tolerance of soil fungi contributes to the severity of soil-burial tests on such fabric.

"Steam sterilization of fabric containing certain common organic preservatives, even for as short an interval as 15 min. at 15 lb. steam pressure, in a number of instances decreased the mildew resistance of the fabric, as indicated by subsequent culture tests. Experience with several fungi indicates that *C. globosum* is more satisfactory than certain other forms for use in tests on nonsterile fabric.

"A filter-paper-mat technic is described in which the test fabric is planted on a mat of fungus mycelium growing on a filter-paper strip supported on a salt agar medium. When the fungus *C. globosum* is used in this test, it is found to be much more severe on treated fabrics than when it is applied by the pipette-inoculum procedure. The presence of independently nourished mycelial inoculum capable of attacking and reattacking the strip at many points is believed to simulate in part the conditions of soil burial.

"Soil-burial tests have been found to be much more drastic on a variety of treated fabrics than the usual pipette-inoculum *Chaetomium* technic.

"Data are presented on the minimum air volume required for the break-down of fabric in tightly sealed containers by *C. globosum*, *Metarrhizium* sp., and *Stemphylium* sp.

"It is concluded that the choice of the best test or combination of tests to determine mildew resistance of a fabric depends on the service conditions under which the fabric is to be used. While the tests now available are still admittedly inaccurate in certain respects, they are capable of yielding much useful information when judiciously interpreted.

"Data are presented on the fabric-preservative properties of a number of fungicidal compounds. A new material of commercial origin, 2,2'-dihydroxy-5,5'-dichlorodiphenylmethane, has unusual fungicidal properties and offers promise as a fabric preservative. Copper naphthenate has been consistently more effective per unit weight on fabric than have several other copper compounds."

## HOME MANAGEMENT AND EQUIPMENT

Research points the way to the kitchen of tomorrow, M. K. HEINER and H. E. McCULLOUGH (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 3, pp. 11-12, illus. 2).—This outlines briefly how sinks, drainboards, working space, and storage facilities have been developed on an adjustable scale to permit different heights, depths, and arrangements of kitchen equipment to be tested out for the best working design and arrangement. Since little is known about kitchen work space and less about the woman who uses it, time and motion studies are needed,

and are under way at this station, to contrast the effectiveness of various working arrangements for saving labor and preventing fatigue in kitchen work. The kind of activities that families prefer to carry on in the kitchen and what sets the pattern for them is also being considered.

**Coffee-making equipment**, P. B. POTTER and A. H. FULLER (*Virginia Sta. Bul.* 367 (1945), pp. 30, illus. 11).—As an aid to the homemaker in selecting equipment and making coffee, studies and tests were made of 15 coffee makers of three different types (dripolators, percolators, and vacuum makers) and of factors involved in the coffee making process. Operational data, and beverage scores (by a small panel of judges) are presented with comments and conclusions. Temperatures between 185° and 200° F., considered by most authorities correct for the extracting temperature, were produced by the vacuum makers; initial and finishing temperatures of the water in dripolators were around 209° and 191°, respectively, these also being satisfactory; and with percolators, temperatures a few degrees above boiling were reached during the process, although the initial and final temperatures were around 200°. The time required for making a potful of coffee varied from 12 to 31 min.; only a relatively small part of this time was required for the water to contact the coffee, about 5 min. for percolators, less for vacuum makers, and more for dripolators. The cost of heat energy for making coffee in the home once a day for a month added only 9 to 21 ct. to the monthly electric bill. Due to escaping steam and absorption by the coffee grounds, the yield of coffee as poured from the pot was from 5 to 14 percent less than the volume of water used; in serving, some allowance should be made for this loss. The vacuum makers showed the lowest losses.

High amounts of coffee with short, mild applications of water gave quality, while smaller amounts of coffee with longer and more vigorous action sometimes gave a strong beverage of low quality. Higher proportions of coffee (2 tablespoons per cup of water) gave best results in all cases except for percolators and appeared to be necessary with vacuum makers; with percolators 1 to 1½ tablespoons gave good results. Fine and extra fine grinds scored high with vacuum makers, but much less so with dripolators and percolators because of the sediment. For the latter two, medium and fine grinds were best. For general use in all equipment, the so-called "drip grind" was satisfactory.

"A summary of points concerning each type of coffee-maker is as follows: Vacuum makers scored the highest on the beverage produced, gave the highest yield, used the shortest contact time, handled the finest grinds of coffee, and produced acceptable temperatures, but required more coffee and were considered fragile to use and handle. Percolators produced average coffee, worked best with medium and fine grinds, required less coffee, and gave the highest temperatures and low yields. Dripolators scored lowest on the product produced, took the most time, gave low yields, required higher proportions of coffee, would not handle the finer grinds, and were considered the poorest performers in coffee making."

**Floor finishes as affected by composition soles and heels of wartime shoes**, B. M. KUSCHKE (*Rhode Island Sta. Misc. Pub.* 22 (1945), pp. 6+).—Tests were conducted to determine the best means of removing the black marks from floors (and restoring them to their original condition) made by composition soles and heels of wartime shoes. A machine originally built to examine certain qualities of wood-floor-finishing materials was adapted to the study of the black marks. By using this machine, it was possible to apply the marks directly to samples of wood and linoleum which had been previously treated with different finishing agents. The small samples were then removed from the machine for further study.

The tests indicated that the best method of removal is that of wiping the floor with a clean cloth wrung from lukewarm water and borax soap solution; stubborn spots respond with rubbing. The operation is completed by wiping the floor with

a clean cloth wrung from clean, lukewarm water, wiping with a dry cloth, and allowing to dry thoroughly before final waxing with a thin coat of good water-emulsion wax applied with a cloth or applicator. After at least 30 min. drying time, the waxing should be repeated. Several thin coats of wax afford better floor protection than a single one. When the finish is badly worn, it should be renewed before waxing. Solvents such as turpentine, alcohol, gasoline, non-inflammable dry cleaners, and commercial cleaners now offered for sale to remove these shoe marks more or less successfully removed the stains but are not recommended for home use, either because of their damage to floor and linoleum finishes or because of fire hazard or danger from poisonous fumes.

## REPORTS AND PROCEEDINGS

**Proceedings of the Association of Land-Grant Colleges and Universities** (*Assoc. Land-Grant Cols. and Univs. Proc.*, 58 (1944), pp. 303+, illus. 1).—In addition to the minutes of the general sessions, sections and subsections, and the executive body, including committee reports and abstracts of papers, these proceedings contain memorials to F. Engelhardt, E. B. House, W. Hullihen, C. B. Lipman, D. B. Swingle, A. Vivian, D. S. White, E. G. Woodward, D. W. Working, and G. A. Young, and the following addresses: The Liberal Education of the "Industrial Classes," by C. B. Hutchison (pp. 24-32); Business Plans for Postwar Prosperity, by P. G. Hoffman (pp. 32-38); American Universities and the Coming Peace, by H. L. Bevis (pp. 39-44); Colleges in the Post-War World, by C. R. Wickard (pp. 45-51); a discussion of problems and policies ahead for the land-grant colleges in agricultural extension, by B. H. Crocheron (pp. 51-53), agricultural research, by H. J. Henney (pp. 53-57), industrial research and engineering extension, by L. J. Lassalle (pp. 57-60), home economics, by L. W. Drummond (pp. 60-62), resident teaching, by H. M. Eberle (pp. 62-65), and the graduate schools, by A. W. Smith (pp. 65-67); Integrated Courses in a Land-Grant Institution, by C. S. Boucher (pp. 83-89); Counseling Students in Colleges, by E. G. Williamson (pp. 89-96); Liberalizing Technical Education, by H. P. Hammond (pp. 96-102); The General College in a Land-Grant Institution, by J. J. Tigert (pp. 102-109); When the Veteran Comes to the Campus, by C. G. Beck (pp. 109-118); New Tools and Methods for Learning, by A. Adams (pp. 118-121); Special Curricula for Veterans, by C. E. Friley (pp. 121-123); The Ohio State University Research Foundation, by A. R. Olpin (pp. 125-131); The Pennsylvania Research Corporation, by F. F. Lininger (pp. 132-134); The Cornell Research Foundation, by C. E. F. Guterman (pp. 134-135); The Army Industrial College—Its Role and Importance, by W. H. E. Jaeger (pp. 176-182); The Graduate School in the Land-Grant Colleges and Universities, by T. C. Blegen (pp. 189-194); and the proposed amended constitution and by-laws of the association (pp. 227-233). The report of the committee on postwar agricultural policy has been previously noted (E. S. R., 92, p. 459).

**Annual Report [of Florida Station], 1944,** H. MOWRY. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1944*, pp. 214+, about 17 illus.).—In addition to items noted elsewhere in this issue, brief progress reports are given on the various projects of the station, substations, and field laboratories. Among the many specific projects for which data are reported are those in agricultural economics on prices of Florida farm products, and utilization of farm labor; agronomy, including peanut improvement, crop rotations, variety tests with Bahia grass, sorghum, oats, cotton, sugarcane, cowpeas, and rye, corn fertilizers, effect of fertilizers on pastures, forage nursery and plant adaptation studies with *Medicago obscura*, *Trifolium negrescens*, *Lotus corniculatus*, *L. uliginosus*, Indigofera, guinea grass, and lupines, forage and pasture grass improvement, pasture legumes, Napier grass for pasture,

methods of establishing pastures, improvement of oats, flue-cured tobacco, and corn, tobacco fertilizers and varieties, weed control in tobacco plant beds, and peanuts; animal industry, including mineral requirements for cattle, phenothiazine as a sheep anthelminitic, infectious bovine mastitis, processing and storage of dairy products, mineral supplements for hogs on peanuts, condensed buttermilk and peanut meal in poultry rations, lighting v. continuous lighting for layers, and wartime emergency laying rations; entomology, including the control of the nut and leaf casebearers of pecans, cutworms and armyworms, breeding nematode-resistant cowpeas and lettuce, new soil fumigants, effect of mulches on the root-knot nematode, control of the Florida flower thrips, and thrips on gladiolus; home economics, including chemical composition and physiological properties of royal jelly, relation of the school lunch to child health and progress, and relation of diet of Florida school children to tooth and bone structure; horticulture, including propagating, planting, and fertilizing tests with tung trees, cover crop, fertilizer, and growth substance tests in pecan orchards, fertilizer studies of peas, cabbage, tomatoes, and sweetpotatoes, soil reaction and growth of Tendergreen beans, effect of green manure crops on vegetables, storage of tomatoes, beans, and lettuce, vegetable variety trials and tung tree studies; plant pathology, including studies of *Sclerotium rolfsii*, failure of seeds and seedlings in Florida soils, phomopsis blight and fruit rot of eggplant, seed treatments of blue lupine, and witches'-broom of oleanders; celery varieties and fertilizers, the garden fleahopper (*Halticus citri* Ashm.), and DDT as an insecticide; potato culture and disease control, downy mildew of cabbage, cabbage culture and fertilizer, fusarium wilt of watermelons, control of cutworms and armyworms, tomato breeding for resistance to diseases and insects, control of lepidoteroous larvae attacking green corn, nutritional diseases of vegetable crop plants, summer cover crops, liming, and related factors in vegetable crop production, ammonium sulfamate as an herbicide, tomato sprays, insect resistance of bush bean and onions, control of the pickleworm and melon worm on squash, soil fertility studies, tomato and cucumber diseases, and control of insect pests and diseases of gladiolus; meteorological observations; plant introductions; control of bean leafroller and leafhopper, potato tuber worm; water control; role of special elements in the peat and muck soils of the Everglades, control of sugarcane moth borer, sugarcane breeding and culture, culture of oats, barley, various grasses, peanuts, sweetpotatoes, corn, soybeans, ramie, and sisal hemp, seed and soil-borne diseases of vegetable crops, bean and tomato breeding, potato spraying for late blight, ascorbic acid analysis of beans and cabbage, beef and dual-purpose cattle investigations, and damping off, mosaic, and early blight of celery; north Florida tobacco varieties and seed germination, sheep growing, cover crops for pecans, culture of corn, oats, barley, wheat, kudzu, velvet beans, soybean, clover (white v. hop), control of downy mildew of tobacco, tankage and mineral supplements for fattening hogs, ground oats for fattening steers, rotations for cigar-wrapper tobacco; hog grazing on oats, and miscellaneous fertilizer, variety, and cultural tests with field crops; feeding beef cows on the range (including mineral consumption), and fertilization of flatwoods pastures; citrus and avocado culture at the Subtropical Station, target leafspot of papaya, fruit spot of white-sapote, breeding papayas, mangoes, and minor fruits and ornamentals, potato and tomato culture, cover crops, control of diseases of potatoes, avocado, mango, and tomato, tomato and other vegetable varieties and culture, diseases of the Tahiti (Persian) lime, and studies with *Cryptostegia grandiflora*, *Sansevieria metallica*, and yam bean; at the West Central Station, pasture studies and poultry breeding; and at the Citrus Station, citrus breeding, investigations of melanose and stem-end rot, citrus nutrition, control of scale insects and mites, a new citrus disease, citrus investigations in the coastal regions, and packing house studies with tangerine

processing, fruit washing, control of stem-end rot and blue mold, and oil sprays for citrus.

**Fifty-seventh annual report [of Kentucky Station], 1944,** T. P. COOPER (*Kentucky Sta. Rpt. 1944, pp. 68*).—In addition to an item covered on page 661, this report notes briefly progress on the following: Barn hay-drier tests, tobacco growing devices, increases in prices of farm lands, milk transportation, tobacco prices, commercial feed marketing, labor requirements on mountain farms, field tests of fused phosphates, residual potash in manure and of phosphates, phosphates for pastures, nitrogen topdressing for bluegrass sod, wheat, and grass for hay, culture of Burley tobacco, loss of nutrients from tobacco stalks by leaching, fertilizers for clover, hybrid v. open-pollinated corn, European corn borer and its control, corn improvement and culture, hybrid popcorn, hardiness of winter oats and barley, varieties of oats, barley, and wheat, tests of Ky 31 meadow fescue, control of the green June beetle and *Phyllophaga* larvae in bluegrass sod and of the plant bugs *Miris dolabratus* and *Amblytylus nasutus*, red clover breeding, corn hay, Sudan grass, soybeans, millet, and buckwheat as late-sown emergency crops, composition of hemp fiber and hurds and tobacco stalks, tobacco varieties, bacterial black stalk, root infection with wildfire and angular leafspot, overwintering of *Xanthomonas vesicatoria* and growth of animal pathogenic bacteria on wheat roots, *Cercospora* isolates, wireworm injury to tobacco, nicotine and tobacco seed oil from tobacco, curing Burley tobacco, apple varieties, apple scab, codling moth, peach pruning and insects, parasites of the oriental moth, plum curculio, cherry rootstocks, strawberry fertilizers and culture, raspberry varieties, potato fertilizers, varieties of sweetcorn, lima beans, and tomatoes, control of tomato fruitworm, effect of boron on spinach, radish, and apples, bluegrass-molasses silage v. alfalfa-molasses silage for fattening steers, pasture forages and slop feeding of steers, alfalfa hay v. red clover hay and alfalfa, bluegrass, and corn silages for ewes, lamb feeding, longevity of *Haemonchus contortus* larvae on pasture, distillers' dried solubles for hogs, pasture nutrients and pasture v. bare range for hens, fats in laying pullets and yearling hens, age and reproduction in the hen, vegetable v. animal protein for pullets, strength of sodium chloride solutions toxic to chicks, resistance of chicks to louse infestations, palatability of phosphorus supplements for dairy cattle, alternate v. continuous grazing of permanent pasture by dairy heifers, bovine mastitis, equine virus abortion, periodic ophthalmia, occurrence of *Salmonella* and paracolon bacteria, arsenic and boron in animal nutrition, manganese in ascorbic acid synthesis, hybrid v. Reid Yellow Dent corn for fattening steers, pasture treatments, grass tests, ammonium nitrate for wheat, variety tests of peaches, plums, strawberries, brambles, and apples, quince rust control, mash and grain v. cafeteria for pullets, and sorghum sirup production.

**Fifty-seventh Annual Report of the [Michigan Station], 1944,** V. R. GARDNER (*Michigan Sta. Rpt. 1944, pp. 161-176*).—This consists mainly of lists of the publications and active projects of the year. Results are also noted of studies on bromegrass seed production, an oil-dip method of egg preservation, changing the breeding cycle in sheep through photoperiodism, and the new varieties Great Lakes lettuce and Early Chatham tomato.

**Fifty-first Annual Report [of Minnesota Station], 1944,** C. H. BAILEY (*Minnesota Sta. Rpt. 1944, pp. 32*).—Among other administrative data, this report lists the station publications of the year.

**Fifty-fifth Annual Report [of New Mexico Station, 1944]** F. GARCIA. (Partly coop. U. S. D. A.). (*New Mexico Sta. Rpt. 1944, pp. 76, illus. 6*).—In addition to material abstracted elsewhere in this issue, this report gives data from the departments of agricultural economics, including the cash receipts and expenses of identical farms 1941-43 to show the effect of adjustments in practice for purposes

of soil conservation and acreage control, production per breeding ewe on southeastern New Mexico ranches, and cost and returns from producing fluid milk in three irrigated valleys; agronomy, including sugar-beet seed yield and quality, breeding and variety tests of barley, corn, sugar beets, cotton, alfalfa, grain sorghums, beans, wheat, tomatoes, and soybeans, cultural tests with sugar beets, cotton, irrigated pastures, dry farming, potatoes, onions, and lettuce, fertilizer tests with sugar beets, cotton, and alfalfa, perennial weed control, and cotton grading; animal husbandry, including revegetation of southwestern ranges, range grazing capacity, seasonal use of phosphorus supplement by range cattle, effect of nutrition levels on wool and lamb production of yearling ewes, physical characteristics of sheep and their offspring, artificial impregnation of ewes, low-protein roughage for fattening cattle, wool-shrinkage estimates, corn silage, cottonseed hulls, and alfalfa for lambs, and carotene content of range forages; biology, including codling-moth life history studies, poison baits and spray schedules, development of pink root, bulb rot, and false blight disease of onions, and insecticides for Mexican bean beetle control; chemistry, including the fiber and saponin of *Yucca* sp.; dairy husbandry, including milk minimum for raising calves, irrigated pastures for dairy cattle, and Johne's disease in milk goats; home economics, including the carotene and ascorbic acid contents of chili and carrots; horticulture, including phenological investigations with stone fruits, tomato varieties and culture, seed treatments of potatoes, Grano onion seed production, and biennial bearing of apples; irrigation of Acala cotton; and poultry husbandry, including rations for birds in laying cages, ferrous sulfate as a preventive of egg yolk discoloration by cottonseed meal, and inheritance of firm egg albumen.

**Report of the Federal Experiment Station in Puerto Rico, 1944.** (Partly coop. U. S. D. A. et al.). (*Puerto Rico Fed. Sta. Rpt. 1944*, pp. 44+).—In addition to a note on bamboo for reinforcement abstracted on page 630, this report notes progress on the propagation and culture of derris; the relative toxicity of rotenone plants; yam bean strains; toxicological value of native plants (notably mamey and yam bean); propagation, grafting, and culture of cinchona; control of thrips on cinchona by nicotine sulfate; introduction and culture of Indian cauliflower (*Brassica oleracea botrytis*), *Psophocarpus tetragonolobus*, *Flacourzia euphlebia*, *Malacantha warneckiana*, and *Durio zibethinus*; correlation of weight of mangosteen seeds with seedling vigor; method of applying hormones; soybean and miscellaneous insects, pineapple mealybug, sugarcane borer, and bamboo scale parasites; chemical treatment of soybean seed; bamboo propagation, culture, and curing; the bamboo powder-post beetle; vanilla root rot; chemistry of vanilla processing; processing of the essential oil of oregano (*Lippia helleri*); coffee flower oil (including a modification of the extractor); variety tests of coffee; and moisture conservation research.

**Fifty-seventh Annual Report of the South Carolina Experiment Station, [1944], H. P. COOPER ET AL.** (*South Carolina Sta. Rpt. 1944*, pp. 154, illus. 31).—In addition to articles noted elsewhere in this issue, results are presented of research in agricultural economics on production adjustments in agricultural areas and the management of Negro farms; agricultural engineering, including tillage methods and other aspects of mulch farming; home economics, including the relation of the physical condition of school children and the economic level, diet improvement through school lunches, and public library progress; field crops and fertilizers, including variety tests of corn, oats, wheat, barley, and rye, hegari culture, plow sole v. row applications of fertilizer for corn, and winter cover crops for cotton; fruits and vegetables, including ripening and canning methods for peaches and retention of color by Cayenne peppers and ground pepper; plant physiology and diseases, including cross-inoculation with fusarium wilt organisms,

wilt-resistant and other cotton strains and varieties, and relation to mineral nutrition, fuzzy v. regimmed cottonseed, control of root knot nematodes by soil fumigation, and the treatment of epidermophytosis by swabbing infected skin areas at intervals of 3 to 5 days with a solution of 10 gm. salicylic acid and 33 cc. each of acetone, 85 percent ethyl alcohol, and glycerol; entomology, including fumigants for the rice weevil and associated storage insects, the oriental fruit moth, tomato fruit worm, tests of DDT, cowpea curculio wintering honeybees, bee improvement, and limited value of *Richardia scabra* as a honey plant; chemistry, including the carotene content of milk, effect of treating corn silage with urea on its carotene content, and enrichment of corn meal and grits; animal husbandry, including gains of purebred v. crossbred pigs, and cottonseed meal and hulls v. shelled corn and lespezeza hay for fattening steers; dairying, including artificial insemination; poultry, including large v. small-type turkeys, and turkey poult production; and results at the substations in fertilizing cotton, cotton varieties and breeding, the cotton boll weevil, and the cotton aphid, tobacco culture and fertilizer, use of DD mixture to control root knot on tobacco, control of blue mold of tobacco, tobacco hornworm, and tobacco flea beetle, soybean variety test, pearl millet for grazing and silage, winter crops for green manures, sprays and dusts for cabbage caterpillars, vegetable seed treatment, and cultural studies with sweetpotatoes and the use of boron.

## MISCELLANEOUS

A method for the solution of normal equations, B. G. CAPÓ (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 28 (1944), No. 1, pp. 1-6).—An improved and simplified method for the solution of normal equations is presented, based on relatively small numbers. The design for a five-treatment experiment is illustrated, based largely on a fertilizer test with cotton.

Micro-organisms and the struggle for existence, L. D. BUSHNELL. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 48 (1945), No. 1, pp. 55-69).—An address dealing with the role of micro-organisms (all microscopic forms, including viruses, bacteria, yeasts, molds, rickettsia, protozoa, and algae) in man's struggle for existence. There are 28 references.

The Colorado Desert of California: Its origin and biota, T. D. A. COCKERELL (*Kans. Acad. Sci. Trans.*, 48 (1945), No. 1, pp. 1-39, illus. 13).—A review of the geology and biology of the region, with 26 references.

Slidefilms of the U. S. Department of Agriculture (*U. S. Dept. Agr., Misc. Pub.* 566 (1945), pp. 24+, illus. 1).—This is a classified subject list.

Farm Research [July 1, 1945] (*Farm Res. [New York State and Cornell Sta.]*, 11 (1945), No. 3, pp. 16, illus. 11).—In addition to articles noted elsewhere in this issue, this number contains On the Importance of Color, by Z. I. Kertesz (pp. 1, 15) (N. Y. State Sta.); A New Principle in Weed Control, by H. B. Tukey and C. L. Hamner (pp. 3, 16) (N. Y. State Sta.), previously covered (*E. S. R.*, 93, p. 284); and Aim Toward Growing Better Hay, by R. Bradfield (pp. 9, 10) ([N. Y.] Cornell Sta.).

## NOTES

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**California University and Station.**—*California Fruit News* notes that an appropriation of \$30,000 has been made immediately available for drawing up plans for buildings and equipment to cost about \$500,000 and to be used for instruction in food canning and food processing. The work will be carried on at Davis.

Dr. Edmond C. Calavan has joined the staff of the division of plant pathology of the Citrus Station at Riverside. It is expected that he will make a study of causes of lemon decline, with special reference to the role of shellbark in the deterioration of lemon orchards in California.

**Colorado College and Station.**—Dean and Director H. J. Henney has been granted leave of absence for a year to become deputy director of the food and agricultural branch of the military control council in Germany. President R. M. Green has been designated as acting director of the station. It is announced that Dr. H. S. Wilgus, Jr., head of the department of poultry husbandry, will become associate director upon discharge from the Army. Dr. E. W. Bodine, professor of plant pathology, has resigned to engage in commercial work.

**Georgia Station.**—During the past fiscal year the station has distributed in nearly every county in Georgia seed of many new varieties of crops it has originated, including 60 tons of Empire cotton, 50 bu. Cherokee sweet corn, 10 lb. Truhart Perfection pimiento, 2,000 bu. Lega and Leroy oats, 125 bu. Gatan soybean, 1,200 bu. Sanford wheat, 8 tons new peanut varieties, 100 lb. Georgia Wilt Resistant water-melon, and 10 lb. African squash seed. A thousand muscadine grapevines and 20,000 sweetpotato plants have also been distributed. This service has been a great help in improving the production of Georgia farms. The station has also pioneered in the artificial insemination of dairy cattle, and during the fiscal year 330 dairy cattle in the State were bred by this method. The station distributed to farmers of the State 5 Hereford bulls, 2 rams, 109 head of cattle, and 300 head of hogs. Research work with pastures has been increased to meet the demands for increased numbers of livestock in the State.

In cooperation with the State Department of Agriculture the station has been designated as an agent for certification of seed grown from seed stock either originated by or produced under the supervision of the station. This is a first step in the effort to develop the production of certified seed in the State. A new study has been begun in cooperation with the Georgia State Vocational Department and other agencies on growing cantaloups to help the farmer get his product in the market as early as possible and with a minimum loss of plants and fruits.

**Kansas College and Station.**—Dr. Harold Howe, professor of agricultural economics and land economist, has been appointed dean of the graduate school vice Dr. James E. Ackert, who is retiring from the position and also that of head of the department of sociology. Emeritus status has been given to G. A. Dean, professor of entomology, Dr. C. O. Swanson, professor of milling industry, and Dr. E. C. Miller, professor of plant physiology. Dr. Josephine Kremer has been appointed head of the department of household economics vice Dr. Ruth Lindquist, resigned. Abby Marlatt has been appointed associate professor of foods and nutrition. Dr. Edward G. Bayfield has resigned as head of the department of milling industry to become director of products control and research for the Standard Milling Company, with headquarters in Chicago. He has been succeeded as head by John A. Shellenberger. Leslie A. Fitz, the head from 1910

to 1922 and since 1925 supervisor of the Chicago field office of the U. S. Department of Agriculture in charge of its commodity exchange activities, died June 18 at the age of 69 years.

**Montana College and Station.**—The legislature at its 1945 session materially increased the budget for agricultural research at the station and branch stations. The increases made to the main station will make possible the reinstatement of the poultry department, which was discontinued in 1926, and also will provide for additional work in animal disease investigations in cooperation with the Montana Livestock Sanitary Board.

Dr. Alvin Schwendiman, superintendent of the Montana Grain Inspection Laboratory, has resigned and has been succeeded by D. J. Davis. Dr. Phil S. Eckert of the Federal Reserve Bank of Cleveland, Ohio, has returned to the institution as professor of agricultural economics and rural sociology.

**Nebraska University and Station.**—Walter L. Ruden, assistant in rural economics, and Edna B. Snyder, instructor in home economics, have resigned. Recent appointments include Dr. Cecil T. Blunn as assistant professor of animal husbandry, Elvin F. Frolik as associate agronomist, Dr. Andrew B. Schultze as assistant professor of dairy husbandry, and D. A. Sander as assistant instructor in agronomy.

**Cornell University and Station.**—Grants amounting to approximately \$10,000 have been made to the university by the Cooperative Grange League Federation Exchange, Inc., for the furtherance of investigations in plant breeding. These grants are made with the objectives of obtaining forage plants suited to New York and vicinity and supplying feed during the summer season of low production and the development of corn hybrids of regional adaptability. Two graduate assistantships in each project are provided.

A new department of extension teaching and information has been established as of July 1. This includes all the press, publications, radio, and visual aids services and the public speaking and journalism courses of the colleges of agriculture and home economics, and combines functions of the former office of publication with new duties heretofore carried on by other offices within the colleges.

Retirements on July 1 included Dean Cornelius Betten, whose services began in 1915; Dr. M. F. Barrus, extension professor of plant pathology, after 37 years' service; Asa C. King, professor of farm practice and farm superintendent, after 34 years' service; Ralph W. Curtis, professor of ornamental horticulture, after 32 years' service; and Cora E. Binzel, professor of rural education, after 32 years' service. Dr. Harold H. Williams has been appointed professor of biochemistry, effective October 1, Dr. George C. Kent, research associate professor in botany and plant pathology in the Iowa College and Station, as professor of plant pathology, Dr. Robert F. Holland as extension specialist in dairy industry vice Dr. H. J. Brueckner, and Marjorie Acheson as extension specialist in home management.

**North Carolina College and Station.**—J. G. Weaver, associate professor and associate horticulturist, has resigned to engage in commercial work.

**North Dakota College and Station.**—James R. Dice, chairman of the department of dairy husbandry since 1920 and assistant to the dean of agriculture and director of the station since 1942, died May 18 in his fifty-eighth year. A native of Pennsylvania, he was graduated from the Michigan College in 1908 and received the M. S. degree from the University of Missouri in 1919. Before coming to North Dakota, he had been instructor in dairy industry in the University of Maine and head of the department of dairy and animal husbandry at the New York State School of Agriculture at Morrisville.

**Oregon College and Station.**—Hubert E. Cosby, head of the department of poultry husbandry since 1937, died July 14. He had been associated with the institution since 1918.

**Pennsylvania College and Station.**—Dr. H. K. Wilson, professor of agronomy and agronomist in the Minnesota University and Station, has been appointed head of the department of agronomy vice Dr. C. F. Noll, who retired with the title of professor emeritus. Dr. C. B. Link, assistant professor of floriculture, resigned August 31 to accept a position as horticulturist at the Brooklyn Botanic Garden. R. U. Blasingame, head of the department of agricultural engineering, has been given leave of absence for one year, beginning July 1, to teach at Shrivenham University, Wiltshire, England, a college for Army personnel awaiting transport back to the United States. Other changes include the appointment of C. O. Jensen as professor of phytochemistry in charge of tobacco research, and D. W. McKinstry as assistant professor of bacteriology.

**Puerto Rico Federal Station.**—Recent appointments include Edward P. Hume as horticulturist in charge of research with mangoes, avocados, and other fruits, and plant introductions. Dr. Arnaud P. Loustalot, assistant plant physiologist of the U. S. D. A. Tung Oil Laboratory at Gainesville, Fla., has been appointed associate chemist, primarily for a study of the quinine content of *Cinchona* when grown under different cultural and environmental conditions.

**Rhode Island Station.**—Frank S. Schlenker has returned from the armed forces to become assistant professor of agricultural chemistry. Mildred Shurtleff has been appointed assistant chemist.

**Texas Station.**—Dr. G. S. Fraps retired on August 31 from administrative work as State chemist and chief of the division of chemistry but will remain with the station on a part-time basis with the title of collaborating chemist. He has been with the institution since 1903 and is widely known as the author of two books and the author or coauthor of about 400 bulletins and scientific articles relating to the composition and properties of soils, nature, use, and composition of fertilizers, composition, nutritive values, and utilization of feeds, analytical methods, composition of insecticides, vitamins, and miscellaneous subjects. Dr. J. F. Fudge has succeeded him as chief of the division and State chemist. Dr. A. R. Kemmerer, chemist, has been appointed head of the department of human nutrition in the Arizona Station.

**U. S. Department of Agriculture.**—The retirement on June 30 is noted of D. L. Van Dine, head of the division of fruit insect investigations in the Bureau of Entomology and Plant Quarantine since 1933. He had previously been associated with the bureau for various periods, beginning in 1910, as well as with the entomological work of the Hawaii Station and the Puerto Rico Insular Station, Cornell University, the Pennsylvania College, and the Cuba Sugar Experiment Station of the Tropical Plant Research Foundation. Dr. Bennett A. Porter has been appointed to succeed him in the Department.

Dr. Howard A. Edson, head of the division of mycology and disease survey in the Bureau of Plant Industry, Soils, and Agricultural Engineering since 1935, retired on August 31. He had also been associated with the bureau from 1910 to 1924 in charge of cotton, truck, and forage crop investigations, as well as with the Vermont University and Station from 1906 to 1910, and was an examiner for the U. S. Civil Service Commission from 1927 to 1934.

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## RECENT WORK IN AGRICULTURAL SCIENCE

### AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Biochemistry investigations of the Connecticut [New Haven] Station] (*Connecticut [New Haven] Sta. Bul.* 484 (1945), pp. 89-93).—The globulin glycinin was shown to be separable from soybeans in yields amounting, at most, to 50 percent of the total protein content of the bean meal. A total of 20 percent more could be separated as a mixture of more soluble globulins with the albumins of the meal. As much as 90 percent of the total protein of the seed could be dispersed by grinding the meal with a neutral solvent in a high-speed mixing apparatus, but only about 70 percent remained in clear solution after supercentrifuge treatment. "It became evident that the soybean contains a far more complex assortment of proteins than is usually assumed, and that much more remains to be learned regarding the chemical and physical properties of these substances before a procedure can be devised by means of which they can be separated into fractions suitable for detailed chemical study."

A new method for determining histidine, a procedure which permits the isolation of the histidine in the form of the insoluble and beautifully crystalline salt of 3,4-dichlorobenzene sulfonic acid by a technic that requires the use of only a relatively small quantity of the protein and can be completed in days instead of the weeks formerly needed, has been shown to confirm with close agreement many observations made earlier by more laborious methods.

An abundant source of optically active isocitric acid has recently been found in the leaves of the common greenhouse plant, *Bryophyllum calycinum*. This previously extremely rare substance can now be obtained in reasonably large quantities for detailed investigation, a discovery which is of importance because of the interest of isocitric acid as a substance now believed essential in the respiration of all cells.

**Processing cottonseed meal: A manufacturing method for eliminating toxic qualities,** C. M. LYMAN, B. R. HOLLAND, and F. HALE. (*Tex. Expt. Sta. Indus. and Engin. Chem.*, 36 (1944), No. 2, pp. 188-190, illus. 2).—Cottonseed meal, prepared by the hydraulic method under a variety of time, temperature, and moisture-content conditions, was tested for animal toxicity in feeding tests, and for gossypol content by chemical analysis. Satisfactory methods for the preparation of meal

<sup>1</sup>The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied on request.

nontoxic to guinea pigs without adding chemicals were found. Determining free gossypol by a new colorimetric method proved reliable and simple.

The fractionation of phosphorus compounds in certain vegetables, E. BENNETT. (Mass. Expt. Sta.). (*Jour. Nutr.*, 28 (1944), No. 4, pp. 269-271).—Total phosphorus, inorganic phosphorus, and phytin phosphorus were assayed directly, while resistant esters and phospholipid and phosphoprotein phosphorus values were calculated by difference in 11 vegetables. The values reported represent averages or duplicate or triplicate determinations on one sample prepared from several kilograms of representative material. Phosphorus determinations on asparagus, cabbage, carrot, dandelion, eggplant, kale, spinach, string beans, squash, turnip, and onions showed phytin to be absent in all cases. Inorganic phosphorus ranged from about 50 to 72 percent of the total. Resistant esters averaged from 7 to 30 percent and phospholipid and phosphoprotein phosphorus from 6.5 to 42.7 percent of the remaining phosphorus.

Isolation of a peptide of  $\beta$ -aminobenzoic acid from yeast, S. RATNER, M. BLANCHARD, A. F. COBURN, and D. E. GREEN (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 689-690).—A brief outline is given of the procedure used to obtain a polypeptide from dried yeast containing 8 percent  $\beta$ -aminobenzoic acid. On the basis of the evidence available, the authors adduce the structure of the compound to be a chain of 10 to 12 glutamic acid residues, linked to the carboxyl group of 1  $\beta$ -aminobenzoic acid molecule. The amino group is presumed to be free.

The function of pyridoxine and pyridoxine derivatives in the decarboxylation of tyrosine, I. C. GUNSLUS and W. D. BELLAMY. (Cornell Univ.). (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 557-563, illus. 4).—A derivative in acid-autoclaved yeast extract and in pyridoxine solutions treated with cystine or with dilute  $H_2O_2$  was shown to function in the decarboxylation of tyrosine. The stimulation of the tyrosine decarboxylase system by these three preparations was in proportion to their pseudopyridoxine content. Unaltered pyridoxine was inactive or much less active in this function. Pyridoxine on standing in the refrigerator or on aeration gradually increased in ability to stimulate the decarboxylase system. *Streptococcus faecalis* (strain 10C1) was used in the original experiments. When it appeared that pseudopyridoxine was involved in the decarboxylation and difficulty was encountered in the preparation of active cells deficient only in this factor, another enterococcus, *S. lactis* R (No. 8043), was used; this has also been identified as a strain of *S. faecalis*.

Spectroscopic study of fish liver oils in relation to vitamin A, F. P. ZSCHEILE and R. L. HENRY. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 7, pp. 436-438, illus. 1).—Eight fish-liver oils with a wide range of potencies and three U. S. P. reference oils were studied spectroscopically and conversion factors determined from the biological potencies. Most samples were studied without saponification, being simply dissolved in purified hexane and examined spectroscopically over the region from 3,100 to 3,800 a. u. under the same conditions as previously employed for crystalline vitamin A (E. S. R., 88, p. 8). The mean of the conversion factors for the fish-liver oils was 2,064, based on readings of the whole oil in hexane. This was in close agreement with the value 2,124 calculated from data reported by the company supplying the oils. With the reference oils, results obtained by different operators or on duplicate samples were reproducible to approximately  $\pm 1$  percent. The three samples were different when first received, with differences in absorption of  $\pm 8$  percent. Conversion factors of reference oils from freshly opened bottles averaged 1,865, based on readings on whole oil in hexane, or 2,073, based on readings of unsaponifiable fractions in ether. Reference oils remained stable during 3 months' storage in the original opened bottles at  $-20^\circ C.$  or at  $\pm 5^\circ$ . Between 3 and 6 mo., however,

one sample increased considerably in absorption. Characteristic ultraviolet absorption curves were studied, and it was emphasized that measurement at a single ultraviolet wavelength was insufficient for a proper spectroscopic evaluation of vitamin A content.

**Constituents of the crude carotene of some forages**, A. R. KEMMERER, J. F. FUDGE, and G. S. FRAPS. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 8, pp. 683-687).—Fresh green forages are reported to have contained from 98 to 400 p. p. m. crude carotene on the dry basis. The crude carotene, on the average, contained 6.4 percent of impurity A, 12.1 percent of neo- $\beta$ -carotene U, 72.7 percent  $\beta$ -carotene, and 8.8 percent neo- $\beta$ -carotene B. The average  $\beta$ -carotene equivalent of the fresh grasses was calculated as 77.1 percent, with a standard deviation of 2.6 percent. The percentages of impurity A and of neo- $\beta$ -carotenes U and B were found higher in dried grasses than in fresh grasses. The average  $\beta$ -carotene equivalent of the dried grasses was 67.8 percent, with a standard deviation of 1.9 percent. It is further reported that: Dormant grasses contained from 8.0 to 71.6 p. p. m. crude carotene. The average percentages of impurity A, neo- $\beta$ -carotene U,  $\beta$ -carotene, and neo- $\beta$ -carotene B were 25.5, 15.6, 51.1, and 7.8, respectively. The average  $\beta$ -carotene was 55.8 percent, with a standard deviation of 10.0 percent. The crude carotene of silages contained an average of 51.0 percent of impurity A, 14.2 percent of neo- $\beta$ -carotene U, 28.9 percent of  $\beta$ -carotene, and 5.9 percent of neo- $\beta$ -carotene B. The average  $\beta$ -carotene equivalent was 31.8 percent, with a standard deviation of 6.6 percent.

**Nature of carotenoids in alfalfa**, A. R. KEMMERER and G. S. FRAPS. (Tex. Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 2, pp. 305-306).—The pigments termed carotenoid X and neo- $\beta$ -carotene, previously found in a number of feeds and foods, were prepared in quantity from alfalfa and were identified as neo- $\beta$ -carotene U and neo- $\beta$ -carotene B, respectively.

**Studies on methods of increasing folic acid activity in liver fractions and in yeast**, G. M. BRIGGS, JR., T. D. LUCKEY, C. A. ELVEHJEM, and E. B. HART. (Univ. Wis.). (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 687-688).—Increase in folic acid activity as measured by *Streptococcus lactis* and *Lactobacillus casei* was obtained upon certain treatments of liver fractions or yeast preparations. Greatest increase occurred when the samples were autoclaved with 2 N KOH or with acid at a pH of 3 to 4. The presence of a reducing agent such as ascorbic acid or Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> during autoclaving under acid conditions appeared to favor the increase.

A method for the determination of substances enzymatically convertible to the factor stimulating *Streptococcus lactis* R, V. MIMS, J. R. TROTTER, and P. L. DAY. (Univ. Ark.). (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 401-405).—A rat-liver extract possessing an enzymatic activity capable of increasing the "folic acid" (*S. lactis* R) stimulating factor of various tissue extracts is described. The liver is blended in a 0.05 M phosphate buffer, centrifuged, and the supernatant fluid treated with ammonium sulfate to 50-percent saturation. The precipitate is discarded and the ammonium sulfate increased to 80 percent saturation. After filtration, the precipitate thus formed is dissolved in phosphate buffer at pH 7 and dialyzed 8 hr. with 8 changes of buffer. It is made up and stored in ammonium sulfate at 50 percent saturation. Materials are assayed in terms of "potential factor," which is the amount found after incubation with rat-liver enzyme, and compared with "preformed factor," the amount measured by direct assay. The increase observed after enzyme treatment varies from about 1.5-fold for potatoes to hundredfold for certain samples of yeast extract.

**A reported growth stimulant for *Lactobacillus casei***, E. J.-H. CHU and R. J. WILLIAMS (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 9-11).—In an attempt to identify the growth stimulant reported by Pollack and Lindner (E. S. R., 90,

n. 294) to be present in natural extracts, particularly Wilson's peptone, the authors studied various mixtures of known compounds. It was found that with a modified basal medium containing per liter 12 mg. of pyridoxine, 0.4 mg. of *p*-aminobenzoic acid, and 0.2 gm. of asparagine the addition of Wilson's peptone had no stimulating effect. Addition of a mixture containing glutamine (25.6 parts), *p*-aminobenzoic acid (0.001 part), and pyridoxal (0.02 part) to the basal media simulated the effect of adding peptone. From these results it is suggested that the stimulation of *L. casei* by peptone is not due to a single "peptone factor" but to its contents of *p*-aminobenzoic acid, material with vitamin B<sub>6</sub> activity, and various unidentified amino acids and peptides.

An inositolless mutant strain of *Neurospora* and its use in bioassays, G. W. BEADLE (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 683-689, illus. 1).—Using essentially the basal medium and technic previously reported by Horowitz and Beadle (E. S. R., 92, p. 8), an assay method for inositol determination was obtained with an inositolless mutant of *Neurospora* (strain 37401). Values for inositol ranging from 5 $\gamma$  to 30 $\gamma$  per 20 cc. of medium could be measured with a high degree of precision (for a bioassay method), provided control standard curves were run simultaneously. Inositol values for a variety of materials (phytin, yeast, potato, malt syrup, egg yolk, corn meal, dried milk, and corn steep liquor solids) were obtained. It was not established whether these values represented both free and combined forms of inositol.

The determination of choline in phospholipids, C. ENTENMAN, A. TAUROG, and I. L. CHAIKOFF. (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 13-18, illus. 1).—A detailed description of a modified reineckate precipitating method for measuring choline rapidly and accurately is given. The basis of the method is the use of 1.2 N HCl which permits the use of more concentrated solutions of reineckate and produces complete precipitation of choline within 30 min. at room temperature. The precipitation is quantitative between 1 and 14 mg., and at those concentrations triplicate values agree to within 3 percent. The method has so far been used only to measure the choline content of phospholipids.

An adsorption procedure for the separation of choline-containing from non-choline-containing phospholipids of liver, A. TAUROG, C. ENTENMAN, B. A. FRIES, and I. L. CHAIKOFF. (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 19-25).—The authors describe in detail what they consider a new approach to the separation of phospholipids. The study was carried out on liver in an attempt to separate lecithin and sphingomyelin fraction from the noncholine containing phospholipids (cephalins). Under carefully controlled experimental conditions the phospholipids are quantitatively and completely adsorbed on MgO, and the elution with methanol removes only the choline-containing fraction.

The determination of pH and titratable acidity (*Pure Cult. Study Bact.*, 13 (1945), No. 2, Leaflet 9, 9. ed., pp. 19, illus. 2).

A method for the determination of oxalic acid in urine, H. H. POWERS and P. LEVATIN (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 207-214, illus. 2).—The method, described in detail, eliminates the troublesome inorganic salts from the urine by extracting the oxalic acid with ether from the acidified urine. A modified Clausen apparatus (illustrated) is employed to facilitate effective extraction from small volumes of urine with correspondingly small volumes of ether, without the difficulty of bumping and other annoying features of ether extraction. Following extraction and removal of the ether, the oxalic acid is precipitated as the calcium salt from an acidified 60-percent alcoholic solution, and finally determined by titration with permanganate by the iodometric technic. The method is accurate with concentrations as low as 7.5 mg. per liter.

**Report on fertilizers, G. S. FRAPS.** (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 4, pp. 581-584).—A number of recommendations for changes in methods of analysis of commercial fertilizer are made.

**Determining chlorophyll, carotene, and xanthophyll in plants, R. B. GRIFFITH and R. N. JEFFREY.** (Ky. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 7, pp. 438-440).—“A method for the determination of chlorophylls a and b, carotene, and total xanthophyll from a single ether solution is described. This method is adaptable to any spectrophotometer of good resolving power, provided preparations are available for determination of absorption constants for the instrument to be used. The pigments are extracted from the plant material with acetone, transferred to ether, and chlorophyll is determined from the light absorption at the wavelengths of the chlorophyll a and b maxima in the red end of the spectrum. Carotene and xanthophyll are separated in the unsaponified ether solution by means of the flowing chromatographic technic and then determined spectrophotometrically. Evidence is presented of the reproducibility of results which may be expected with this method. Single determinations seldom vary more than 5 percent from the average of four similar samples in the case of each pigment determined.”

**Investigations of amino acids, peptides, and proteins.—XVII, The determination of glutamic acid in protein hydrolysates by a microbiological method, M. S. DUNN, M. N. CAMILN, L. B. ROCKLAND, S. SHANKMAN, and S. C. GOLDBERG.** (Univ. Calif. et al.). (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 591-603, illus. 2).—A modification of the general method elaborated by McMahan and Snell (E. S. R., 91, p. 633) is presented in detail. Casein and silk fibroin hydrolysates and a combination of synthetic amino acids comparable to those found in casein were tested with *Lactobacillus arabinosus*, and satisfactory results were obtained. Glutamic acid values of 22.5 and 2.03 percent for casein and silk fibroin, respectively, were found. The procedure described was found to be inapplicable to *l*(+)- and *d*-glutamic acids, and the authors suggested that the unnatural antipode of glutamic acid may play some essential role in the metabolism of *L. arabinosus* 17-5. A discussion of the literature (61 references) pertaining to the subject is given.

**Determination of carbonates in feeds, G. S. FRAPS.** (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 3, pp. 438-440).—The factor weight or 7 gm. of the feed is treated with hydrochloric acid in a bottle attached to a gas-measuring apparatus. The percentage of carbonates is calculated from the volume of carbon dioxide produced.

**Microscopic determination of wheat bran in wheat gray shorts, E. E. BROWN and G. S. FRAPS.** (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 165-168).—The sample is ground to a uniform size, diluted with wheat flour, and the bran particles are counted in 0.01 gm. weighed on a microscopic slide. The count is converted to percentage of bran by use of a factor obtained by using pure wheat brans. The bran so determined was found to be related to the crude fiber content of the wheat gray shorts.

**Simplification of U. S. P. XII microbiological vitamin assays, W. F. ELIAS, J. MERRION, A. NAGLER, and M. BROOME** (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 7, pp. 622-627, illus. 4).—In tests with nicotinic acid, niacinamide, riboflavin, and yeast extracts, it was found possible to obtain comparable results in the U. S. P. XII microbiologic vitamin assays by the substitution of pH values for titration values in the construction of the curve for potency determination. Such a procedure required less time and manipulation than titration in the microbiologic vitamin assays.

**Report on carotene in feeding stuffs, A. R. KEMMERER.** (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 4, pp. 542-546).—The importance of chromatographic methods, using calcium hydroxide as an adsorbent, for the determination of the constituents of crude carotene is emphasized. Modifications that make the A. O. A. C. method for crude carotene in dried hays and plants applicable to

fresh green materials, fresh carrots and apricots, fresh sweetpotatoes, dehydrated fruits and vegetables, and materials high in lycopene are given. A method for estimating carotene in dehydrated alfalfa leaf meal without using alcohol is described.

**Report on riboflavin.** A. R. KEMMERER. (*Tex. Expt. Sta.*). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1941), No. 4, pp. 540-542; *abs. in Texas Sta. Cir.* 107 (1944), p. 43).—It is recommended, on the basis of satisfactory results by Strong and Carpenter (E. S. R., 89, p. 514) and Wegner et al. (E. S. R., 90, p. 11), that the microbiological method, as previously modified to involve acid extraction of the test materials at pH 4.5 (E. S. R., 90, p. 153), be tentatively adopted for the determination of riboflavin in foods and feeds. It is also recommended that the microbiological method be further studied with a view to improving the basal medium and that fluorometric methods for riboflavin be further studied so that such a method may be recommended for materials other than yeast, dried skim milk, and alfalfa.

**A method for the determination of five-tenths to two millimicrograms of riboflavin.** O. H. LOWRY and O. A. BENSEY (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 71-77, illus. 1)—A micromethod for the microbiological determination of riboflavin is described in detail. Modifications of the original Snell and Strong basal medium (E. S. R., 82, p. 587) are slight. Potassium acetate is substituted for sodium acetate, and cysteine is found to be useful. In order to carry out assays on the riboflavin content of the cornea of the rat it was necessary to be able to measure accurately as little as 1 to 2  $\mu\text{g}$ . of the vitamin. By utilizing the modified basal medium in 6  $\times$  50 mm. serological tubes limiting the total liquid per tube to 0.2 cc. (using fine or specially constructed pipettes for accuracy) and incubating under an atmosphere of  $\text{CO}_2$ , accurate results could be obtained. The riboflavin sample and standard solutions were made up in 0.002 N HCl to avoid destruction during autoclaving. Titration with 0.3 N NaOII gave results which measured 0.5 to 2.0  $\mu\text{g}$ . of riboflavin, with an error of less than 5 percent.

**'Thiamine content of pharmaceuticals: Comparative study of rat-curative, thiochrome, and fermentation methods.** D. J. HENNESSY, S. WAPNER, and J. TRUHLAR (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 7, pp. 476-478).—Twenty-nine pharmaceutical products were assayed by the rat-curative bioassay as described in the U. S. Pharmacopoeia XII, by the thiochrome method of Hennessy and Cercedo (E. S. R., 82, p. 588) and the fermentation method of Schultz, Atkin, and Frey (E. S. R., 88, p. 293). "The average for the thiochrome values was 95.4 percent of the rat-curative values, 83 percent of the samples being less for the thiochrome than for the rat-curative. The average for the fermentation values was 98.3 percent of the rat-curative values, 62 percent of the samples being less for the fermentation than for the rat-curative. The ranges of values were moderate and indicate that, for these products, any one of the three methods was satisfactory."

**Use of the macro fermentation method for thiamine assay.** N. S. SCRIMSHAW and W. B. STEWART (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 79-86, illus. 2)—Modifications in the yeast fermentation method of Schultz, Atkin, and Frey (E. S. R., 88, p. 293) were made to overcome three sources of error which were found by the authors to occur in the assay of meat and eggs: (1) A variation in the linear response to graded amounts of thiamine depending upon the substance assayed and the yeast used, (2) an enhanced activity of crystalline thiamine in the presence of food samples added to the basal medium, and (3) the incomplete destruction of thiamine activity in stimulating  $\text{CO}_2$  production of yeast, as already pointed out by Deutsch (E. S. R., 92, p. 759). Modifications of the assay procedure which eliminate these potential errors are (1) a preliminary run with each type of substance in which graded amounts of thiamine are added to the blank, determining the range over which the response to  $B_1$  is linear;

(2) a triplicate assay in which one bottle contains the sample, one the blank alone (which is the sample after sulfite cleavage to destroy the thiamine originally present), and the third the blank plus a suitable amount of thiamine as determined in (1); (3) the amount of gas produced by the known amount of thiamine in the presence of the blank is used as a basis for calculation of the thiamine content of the sample; and (4) the effectiveness of the sulfite cleavage of a known amount of  $B_1$  added to the blank is determined for each type of substance assayed.

The microbiological assay of tryptophane in proteins and foods, R. D. GREENE and A. BLACK (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 1-8, illus. 1).—Using essentially the basal medium of Snell and Wright (E. S. R., 87, p. 12) for niacin assay but omitting tryptophan and including niacin, the authors have described in detail a successful assay procedure using *Lactobacillus arabinosus* 17-5. Samples were prepared for assay by enzymatic or  $Ba(OH)_2$  digestion. Preliminary treatment by pepsin digestion (1 percent) or autoclaving ( $\frac{1}{2}$  hr.) with water frequently increased the values obtained by pancreatic digestion, which was carried out at pH 8.2 at 37° [C.] for 24 hr. The digested sample was then brought to pH 4 and extracted successively with two 100-cc. portions of ethyl ether followed by 30 cc. toluene. (This procedure eliminated any indole or anthranilic acid present which interferes with the assay). The resulting solution was adjusted to pH 6.8 for use. A blank sample containing pancreatin alone was treated similarly and assayed simultaneously. Correction for the tryptophan content of pancreatin (1-1.5 percent) was necessary when this enzyme was used. A  $Ba(OH)_2$  digestion of the sample was found to give more constant recoveries of added tryptophan. The sample was autoclaved with 5 N  $Ba(OH)_2$  for 6 to 10 hr. at 15 lb. pressure and the hydrolyzate then adjusted to pH 4 with 10 N  $H_2SO_4$ . After dilution and centrifugation the separated liquid was cooled and extracted as indicated above to remove indole, etc. The assay results from this method of preparation when multiplied by 2 to correct for racemization indicated quantity recovery of tryptophan. *L. fermentum* showed a growth response which reacted to concentrations of tryptophan from 0γ to 20γ per tube by a standard curve (0.3 cc. to over 9 cc. 0.1 N acid produced). The method appeared reliable in respect to recovery of added tryptophan, concordance of results calculated at different sample levels, and reproducibility of independent assays. Results obtained by both pancreatin and  $Ba(OH)_2$  digestion of a number of proteins, meats, legumes, grains, and other products compared favorably with those reported in recent literature.

The determination of tocopherols with iron-bipyridine reagent in the presence of fats, II. KAUNITZ and J. J. BEAVER (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 653-659, illus. 4).—A modification of the Emmerie and Engel bipyridine reaction was made in an attempt to improve the accuracy of the method in the presence of fats. Petroleum ether solutions of  $\alpha$ -tocopherol and fat or oil (sesame oil, coconut oil, lard, or rat fat) were treated with the iron bipyridine reagent and read spectrophotometrically. Maximum readings, obtained in the first 10 min. after the addition of the reagent, were plotted. Similar solutions containing a known additional amount of  $\alpha$ -tocopherol were likewise assayed. From the original readings and slope of the curve plotted, the amount of  $\alpha$ -tocopherol originally present could be calculated (by a given formula). In general, the presence of carotene did not cause errors in the readings exceeding 10 percent. Addition of sterols (cholesterol) did not materially influence the extinction obtained. The authors conclude that "fats and oils exert a depressing effect on the intensity of the color produced by tocopherols with the iron- $\alpha,\alpha'$ -bipyridine reagent, varying with the concentration as well as the nature of the fats."

**Studies of the mechanism of the reaction of tocopherol with iron- $\alpha,\alpha'$ -bipyridine in the presence of fats.** I. H. KAUNITZ and J. J. BEAULR (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 661-671, illus. 10).—Employing the technic described above, the authors studied varied factors which were thought to influence the color reaction. The addition of glycerol, oleic acid, ethyl alcohol, benzene, or acetone had no appreciable influence on the depressing effect of fats on the iron  $\alpha$ - $\alpha'$ -bipyridine reaction of tocopherols. This depressing effect on the color reaction caused by fats and oils also occurred with peroxide-free and hydrogenated fats and saturated hydrocarbons (hexadecane and paraffin). No color depression was noted with ethyl laurate or tripalmitin. The depressing effect observed in the presence of tocopherols was also found if carotenes were used as the reducing agents, or in the absence of both tocopherol or carotene, when ferrous ion was exposed to the action of fat, especially if the ferrous ion was added to the fat before addition of the bipyridine. The authors imply that the color-depressing effect is due to some interaction between fats or hydrocarbons and ferrous and ferric ions. The reaction is also complicated in the absence of fat by an intricate system of equilibria involving the concentration and ratios of bipyridine and ferrous and ferric ions.

**The chemical estimation of tocopherols in blood plasma.** M. L. QUAIFE and P. L. HARRIS (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 499-505, illus. 1).—A new simplified method of vitamin E assay in plasma has been devised, based in part upon an extraction step similar to that of Kimble for vitamin A assay (E. S. R., 83, p. 708) and upon the use of the Emmerie and Engel reagent (E. S. R., 82, p. 15) for color development. The method, described in detail, consists in mixing plasma with an equal amount of absolute alcohol, extracting with purified Skellysolve B, and evaporating an aliquot of the Skellysolve extract to dryness under nitrogen on a steam bath. The residue thus produced is taken up in a known amount of absolute alcohol (10 cc.), and this alcohol solution is then hydrogenated at 35 lb. pressure for 20 min. After centrifuging the resulting solution, an aliquot of the supernatant fluid is treated with the necessary reagents ( $\alpha,\alpha'$ -bipyridine and ferric chloride reagents) and read after 15 sec. in an Evelyn colorimeter. The tocopherol content is determined from a calibrated curve prepared from pure natural  $\alpha$ -tocopherol in absolute ethyl alcohol. Comparison with results obtained by bioassay on dehydrated beef serum showed good agreement between the chemical and biological methods. Tocopherol levels were found to be between 0.9 and 1.6 mg. percent, with an average of 1.20 mg. percent in a small series of plasma samples from normal subjects.

**Preparation of small animals for analysis.** G. S. FRAPS. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 224-226).—The animals are cooked in an autoclave for 3 hr. at 15 lb. pressure. They are then ground through a meat grinder with the addition of about 2.5 percent of ground filter paper to absorb the liquids.

**Preparation of nematodes for permanent microscopic examination.** J. W. WARD. (Miss. Expt. Sta.). (*Stain Technol.*, 20 (1945), No. 3, p. 99).—A brief note.

**Dried egg white for Mayer's albumen glycerol fixative.** R. R. FAULKNER and R. D. LILLIE (*Stain Technol.*, 20 (1945), No. 3, pp. 99-100).—A brief note.

**Determination of elemental sulfur in insecticides and fungicides.** G. S. FRAPS and T. L. OGIER. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 3, pp. 440-442; abs. in *Texas Sta. Cir.* 107 (1944), p. 44).—The method here suggested for further study is based upon the solubility of crystalline sulfur in carbon disulfide. Other carbon disulfide-soluble substances are usually absent.

**Mildew tests, 1945.** L. P. HART, M. W. WESTGATE, and H. A. GARDNER (*Natl. Paint, Varnish, and Lacquer Assoc. Cir.* 707 (1945), *Sci. Sect.*, pp. 427-434, illus. 3).—A brief summary and tabulation of the results of laboratory tests initiated to

devise a technic for evaluating various "mildewcides" incorporated in paints and varnishes.

**Detection of zinc phosphide.** F. J. SALT (*Vet. Jour.*, 101 (1945), No. 5, p. 111)—A method is described by which the presence of zinc phosphide can be detected in suspected cases of poisoning in poultry where the quantity present is too small to be diagnosed by odor on post mortem examination (see p.—).

**Sulphur dioxide solution as a preservative for fruits and vegetables.** J. G. WOODROOFF and S. R. CECIL (*Georgia Sta. Bul.* 238 (1945), pp. 32, illus. 14).—Sulfur dioxide in a concentration of 1,500-2,000 p. p. m. is considered an effective preservative for fruits, fruit pulp, and fruit juices later to be reprocessed into preserves, etc., or into vinegar, wine, or brandy. The materials are cheap, operation of the plant is simple, and it is believed that fruit growers, produce markets, canners, freezers, and distributors of fruits could use the method as a means of saving many fruits which are now periodically wasted in the South. The equipment required is less than that for canning, the actual cost of preservative is less than \$5 per ton of product, barrels in which the fruit is stored may be reused, and the preserved fruit may be held for 2 yr. or longer for reprocessing. It is also believed that a few vegetables, such as horseradish, cucumbers, cauliflower, sauerkraut, pimientos, and young onions, later to be used to a limited extent in soups, pickles, etc., may be preserved with sulfur dioxide, alone or in combination with brine.

## AGRICULTURAL METEOROLOGY

**Climatology.** B. HAURWITZ and J. M. AUSTIN (*New York and London: McGraw-Hill Book Co.*, 1944, pp. 410+, illus. 56).—Since this book is designed to provide an introduction to climatology for students of meteorology, the authors have stressed the physical causes of climates and the variations of the climatic elements in space and time. Descriptions of the various climates are given in meteorological language, emphasis being placed on the interpretation in terms of dynamics of the atmosphere, of the air mass types, and of frontal activity. In addition to serving as a textbook of general and regional climatology, it is hoped that the book may also prove useful for private study by readers desiring a general survey of the field of climatology or wanting information about the climate of a definite region.

**Climatic maps of geologic interest.** S. S. VISHER (*Bul. Geol. Soc. Amer.*, 56 (1945), No. 7, pp. 713-736, illus. 30).—The author presents 30 maps of the United States showing climatic conditions which distinctly influence geologic processes. They are based on U. S. Weather Bureau data and on a more extensive body of such material than has until recently been available; several are original. All show considerable regional contrasts which clearly or presumably correlate with various geologic processes and their consequences; some of these correlations are pointed out.

**Climates of Texas.** R. J. RUSSELL. (La. State Univ.). (*Ann. Assoc. Amer. Geog.*, 35 (1945), No. 2, pp. 37-52, illus. 2).—This analysis of Texas climates was undertaken to test the merits of the Köppen classification as modified by the author, to present a climatic map based entirely on frequencies of climatic years, and to portray the climatic landscapes of the State. The discussion is presented under modification of the Köppen classification, climatic boundaries, temperature belts, precipitation belts, and climatic regions.

**Equivalent temperatures as a climatic factor.** V. PORITZKI (B. I. PORITSKII) (*Izv. Akad. Nauk S. S. R. (Bul. Acad. Sci. U. R. S. S.), Ser. Geog. and Geophys.*, 8 (1941), No. 4, pp. 199-205, illus. 4; *Eng. abs.*, p. 205).

**Traveling disturbances as a climatic control**, S. A. CAIN. (Univ. Tenn.). (*Jour. Tenn. Acad. Sci.*, 20 (1945), No. 2, pp. 218-223, illus. 6).—This paper presents an illustration of traveling disturbances based on an analysis of conditions at the University of Tennessee Climatological Station for February 1944, showing that they are a very important factor in climatic control.

**Remarks on turbulent transfer across planes of zero momentum-exchange**, F. A. BROOKS and W. P. BERGGREN. (Calif. Expt. Sta.). (*Amer. Geophys. Union Trans.*, 25 (1944), pt. 6, pp. 889-894, illus. 2).—This is a critical review (10 references) and presentation of a revised procedure which it is believed will permit calculation of heat and moisture transport from the ground under the usual atmospheric conditions.

**On theories regarding some electrical aspects of thunder-storms**, O. H. GISH (*Amer. Geophys. Union Trans.*, 25 (1944), pt. 4, pp. 571-575).

**A suggested method of reporting rainfall-records**, D. B. KRIMGOLD. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, 25 (1944), pt. 6, pp. 835-837).—The need for expressing rainfall in such a way as to show for individual storms the total amount, rates, and distribution of rates within the storm has been pointed out by others. The method described is presented as a possible solution. It is proposed that three basic rates of precipitation—such as 0-1, 1-3, and over 3 in. per hour—which are most suitable for the particular hydrologic region, be used by the reporting station. For purposes of reporting, an individual storm is defined as one which having started does not cease for more than an hour. No break-down is made for amounts of 0.05 in. or less occurring in less than 5 min. within the storm. Some detailed procedures and results of their use are discussed and tabulated.

**Correlations of solar variation with Washington weather**, C. G. ABBOT (*Smithson. Misc. Collect.*, 104 (1945), No. 13, pp. 10, illus. 5).—In 1936 (E. S. R., 75, p. 443) the author "showed that ups and downs in the values of the solar constant of radiation were attended by changes of large magnitude and long duration in the temperature of Washington, [D. C.], and other stations. These effects were always symmetrically opposed like the right and left hands." The present paper—delivered before the American Geophysical Union, May 31, 1945—presents further evidence, based on measurements of what is called "critical frequency" in ionization layers of the atmosphere. From analyses of the data presented a strong correlation was found between solar activity and Washington temperature and precipitation. Curves for the latter showed strongly marked features with symmetrical opposition in precipitation corresponding to rising and falling solar activity. It appeared also that approximate predictions a week in advance could be made of the dates of peaks and troughs of Washington temperature if daily reports of  $F_e$  (a quantity related to ionization layers of the atmosphere) were obtained from a sufficient number of ionization stations and if means could be found to anticipate by a few days closely the date of the next approaching solar change. It is believed a fair hope that such important dates as those of heavy frosts may become predictable a week in advance from solar observations by the method proposed; this means would appear applicable to any station in the world for which daily temperature records for the past 20 yr. are available.

**The average length of the season with snow-cover of various depths in New England**, R. G. STONE (*Amer. Geophys. Union Trans.*, 25 (1944), pt. 6, pp. 874-881, illus. 5).—The general significance of a snow cover as it affects many physiographical and ecological processes, as well as human economy, is well known. Records of the depth of precipitation as snow are abundantly available but are not of such immediate practical utility as those of the depth of snow lying on the ground; unfortunately there is no simple correlation between the two phenomena.

The series of maps here printed and discussed shows on a topographic base the average number of consecutive weeks per winter with 2 in. or more, 5 in. or more, 10 in. or more, and 15 in. or more of snow cover, respectively. The features of the distributions are readily evident on inspection, the effects of the Atlantic Ocean and of the topography apparently predominating. The only feature not anticipated was the absence of a marked latitude effect; differences in elevation produced by far the greater part of the variation in snow cover.

**Monthly Weather Review [January–March 1945]** (*No. Weather Rev. [U. S.], 73 (1945), Nos. 1, pp. 21, illus. 15; 2, pp. 23–39, illus. 11; 3, pp. 41–60, illus. 12*).—In addition to meteorological, climatological, solar radiation, and sunspot data in each number, No. 1 contains articles on Preliminary Report on Tornadoes in the United States During 1944 (pp. 1–3) and The Weather of 1944 in the United States (pp. 4–7), both by J. L. Baldwin.

## SOILS—FERTILIZERS

[**Soil Survey Reports, 1934 and 1939 Series**] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. [Soil Survey Rpt.], Ser. 1934, No. 26, pp. 110+, several illus.; Ser. 1939, No. 3, pp. 57+, several illus.*).—These surveys were made in cooperation with the State experiment stations as respectively noted: 1934, No. 26, La Porte County, Ind., H. P. Ulrich et al. (Ind. Expt. Sta.); and 1939, No. 3, Princess Anne County, Va., C. S. Simons and E. Shulkrum (Va. Expt. Sta.).

**Land types in eastern Colorado**, L. A. BROWN, D. S. ROMINE, R. T. BURDICK, and A. KREZER (*Colorado Sta. Bul. 486 (1944), pp. 45+, illus. 31*).—This bulletin discusses the land resources of eastern Colorado by presenting information on the distribution of the various land types in the area and how these land types and prevailing climatic conditions influence crops grown, yields obtained, cultural practices, and land use on nonirrigated lands in the various climatic zones. A land type map, graphs, and tables are included to show some of the relationships of land types and crop yields in eastern Colorado. Land use conditions, with erosion and conservation practices, are illustrated with several photographs.

**Physical land conditions in Washington County, Minnesota**, J. A. BONSTEEL and G. A. SIMPSON (*U. S. Dept. Agr., Soil Conserv. Serv., Phys. Land Survey No. 36 (1944), pp. 42+, illus. 12*).—This field survey is reported and discussed.

**Rhode Island soil types: Texture and chemical composition, and a utility index**, J. B. SMITH and B. E. GILBERT (*Rhode Island Sta. Bul. 296 (1945), pp. 35+, illus. 1*).—Analyses of soil samples representing the profile horizons of the principal soil series of the State are presented to supplement the field data published in soil survey reports of the State (E. S. R., 81, p. 617; 88, p. 160; 89, p. 518). Except in a few instances, the samples were taken from virgin areas or from fields not cultivated recently. The analyses include the determination of particle-size distribution, pH values, exchangeable hydrogen, exchange capacity, nitrogen, organic matter, and readily available phosphorus. The surface soils tend to be coarse in texture, since nearly two-thirds of the arable area is fine sandy loam, sandy loam, or loamy sand. All unlimed profiles are very acid in the upper horizons, but the acidity tends to decrease in the subsoils. Exchangeable hydrogen is correlated with finer texture and organic matter, but pH values show little definite relation to texture or parent material. In agreement with low pH values, exchangeable hydrogen is a large proportion of the exchange capacity. Exchange capacity, organic matter, and nitrogen tend to increase with fineness of texture, but show little relation to parent material. All decrease markedly with depth, with the greatest decrease in the upper horizons of the subsoil as compared with the zone of root growth in the topsoil. There is little accumulation of organic matter in the subsoils from root

decomposition or downward movement. Except in a few instances, the readily available phosphorus is below the limits specified for general crops. A plan is presented for rating local soils by considering a number of factors based on the soil survey and observable in the field and by combining these factors as a single value index, useful in planning land utilization.

**Relation of the physical properties of different soil types to erodibility,** T. C. PEELE, E. E. LATHAM, and O. W. BRALE (*South Carolina Sta. Bul. 357 (1915)*, pp. 31, illus. 8).—Runoff and soil loss from Cecil and Durham sandy loams was greater than from Cecil and Madison clay loams under clean tillage conditions. This is attributed to the fact that relatively impermeable surface layers resulting from the beating action of rainfall form more quickly on the sandy loams than on the clay loams. The data indicated that this is due to degree of aggregation of the soil and degree of dispersion of the soil colloids. The fine material present in the sandy loams was more highly dispersed than that in the clay loams.

The best method found for predicting runoff and erosion other than by actual measurements during natural storms was the use of simulated rainfall applied by a specified type of apparatus for measuring infiltration and erosion directly in the field. Data from the dry runs gave better correlations with results from natural storms than data from the wet runs. Physical properties of the soils determined in the laboratory were found to be related to erodibility, but no single value gave a satisfactory index of susceptibility to erosion. Some of the laboratory values most useful in estimating erodibility were mechanical analysis, dispersion ratio, degree of aggregation, and water of imbibition. A combination of these with a measurement of percolation rates through the soil in its natural structure affords information for a fair estimate of relative erodibility. High ratios of colloid content to exchange capacity, colloid content to moisture equivalent, and low water of imbibition per gram of clay in the soil were associated with relatively high infiltration rates and resistance to erosion. The effects of surface cover on runoff and erosion from a given soil type were much greater than the effects of differences in physical properties of the different soil types.

**Conservation and land use investigations at the Red Plains Conservation Experiment Station, Guthrie, Oklahoma, and the Wheatland Conservation Experiment Station, Cherokee, Oklahoma,** H. A. DANIEL, H. M. ELWELL and M. B. COX. (*Coop. U. S. D. A. (Oklahoma Sta. Mineog. Cir. 139 (1945))*, pp. 14+).—This circular presents information on soil and water losses in relation to surface cover, conservation, and land-use practices on land suitable for cultivation and for land not suitable for cultivation, and discusses machinery for conservation farming. In conclusion, the authors point out that severe erosion can be controlled, floods materially reduced, and crop and food production maintained at about one-third higher level by wise land use and practical conservation farming.

**Compaction in cultivated soils,** M. R. HUBERTY. (*Univ. Calif. Amer. Geophys. Union Trans., 25 (1944)*, pt. 6, pp. 896-899, illus. 2).—The penetration of rain and irrigation water into the soil in many orchards in southern California has been restricted by a compacted layer produced by cultural operations. Investigations have shown that this trouble is dominant on alluvial soils derived from igneous rocks high in quartz. These soils often have a good distribution in particle size from coarse gravel to clay. Reductions to pore space as great as 50 percent have been observed in the field. The degree of compaction under uniform loading and variable moisture content has been determined on a range of soils. Curves representing relationships between moisture percentage and soil density, and moisture percentage and resistance to a Proctor needle are shown for three soils. Soils with wide ranges in particle size were compacted to a much higher density than uniform-grain-size soils. The effect of vibration on compaction and methods of improving water penetration on compacted soils are discussed.

Fertility rises in ungrazed grassland but pastures must be carefully managed, J. W. WHIE (Pennsylvania Sta. Bul. 464, Sup. 3 [1915], p. 4-6, illus. 2).—Long-time results from the Jordan Fertility Experiments are presented to show the importance of grass in maintaining soil fertility. The Jordan plots are on Hagerstown silt loam, which is inherently high in productivity, and have been in a 4-yr. grain rotation of corn, oats, wheat, and mixed hay. For determining the long-time effect of grass, the grassed division strips and roadways, in grass since 1867, have been studied, with unfertilized check plots used as an example of poor farming practice. The unfertilized grassland soils showed a nitrogen level 68 percent above the unfertilized plot soil, 40 percent above the PK treatment, 42 percent above the NPK, 19 percent above the soil treated with 6 tons of manure, and almost 12 percent above that treated with 10 tons of manure. Nitrogen and organic matter contents are accepted measures of fertility, although soils often require other amendments to improve their productivity. The grassed roadway soils maintained a nitrogen level 20 percent higher than the plot soil, which received biennially 10 tons of manure and a level about 73 percent above the average of the five unfertilized plots.

The leaching of some plant nutrients following the burning of forest litter, R. F. FINN (*Black Rock Forest Papers*, 1 (1943), No. 21, pp. 128-134+).—By using special boxes in which holes had been bored to permit sampling, the leaching of nutrients from leaf ashes was studied from a sand and a loamy clay. When the organic matter is destroyed by fire there is a loss of nitrogen through volatilization. The amount of loss is dependent on the intensity of the fire. The greater the amount of organic matter destroyed, the greater is the loss of nitrogen by volatilization. Nitrates, calcium, and potassium were lost by leaching from the soil and sand following the burning of the litter. Calcium was lost in the greatest quantities, followed next in order by nitrates. There is some evidence that phosphorus also was leached from both boxes. The addition of the leaf ashes changed the soil and sand reaction from the acid to the alkaline side, but at the end of the first year the reaction had again become acid in both boxes.

Fertility runoff losses from manure spread during the winter, A. R. MIDGLEY and D. E. DUNKLE (*Vermont Sta. Bul.* 523 (1945), pp. 19, illus. 5).—Studies were instigated to determine the runoff losses of nitrogen, phosphorus, and potassium taking place from manure spread during the winter months under Vermont conditions. Field and laboratory experiments are reported.

When the ground is frozen, considerable runoff may occur from melting snow during a thaw in winter or early spring, especially if accompanied by rain. The greatest runoff in Vermont usually occurs in February and March. Steepness of slope does not seem to be as important in affecting runoff losses as is the location of the land and the amount of snow received, because all frozen ground is impervious.

The color and organic matter content of the runoff water seem to be due to soluble potassium and ammonium humates and vary according to the amendment added to the manure. Runoff water from untreated manure was about twice as dark as that from manure receiving superphosphate. Hydrated lime at the rate of 50 lb. per ton of manure also lightened the color of the runoff water, but heavier rates often darkened it, primarily because of the flocculating effect of the calcium salts. Average nutrient runoff losses from an application of 10 tons of untreated manure were found to be as follows: Nitrogen, equivalent to from 20 to 70 lb. of sodium nitrate; phosphorus, equivalent to from 12 to 25 lb. of 20-percent superphosphate; and potassium, equivalent to from 27 to 55 lb. of 50-percent muriate of potash. Rather large amounts of nitrogen may be lost in the runoff when heavy applications of manure are spread on frozen ground. The amount lost in this fashion depends primarily on the amount previously lost into the air by freezing and drying. Volatilization losses are usually greater than

runoff losses because they begin to occur as soon as the manure is produced, and much of the ammonia is lost into the air before runoff occurs.

The addition of superphosphate to fresh manure increases runoff losses of nitrogen. This is due to the fact that the superphosphate reduces volatilization losses and saves some nitrogen in the manure which is then carried away in runoff. Hydrated lime added to fresh manure (in the gutter) increases nitrogen runoff losses. This is because hydrated lime is so alkaline that it reduces the formation of ammonia and the resultant losses of nitrogen into the air. Consequently, more nitrogen is left to be lost in runoff. Limestone added to superphosphated manure at the time of spreading reduces phosphate and potash runoff losses somewhat. Bedding material, such as straw, greatly reduces volatilization losses of nitrogen, but much of this saved nitrogen is still soluble or in a form which may be lost in runoff. Phosphate losses from untreated manure are small. When superphosphate is added to the manure, losses are increased. Potash losses are usually greater than losses of nitrogen and phosphorus combined, on an N P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O basis. These high losses can be explained by the fact that most of the potash in cattle manure is in the urine and is thus very soluble.

Results of agronomic research on the use of lime and fertilizers in Ohio, R. E. YODER (*Ohio Sta. Agron. Memog. No. 96 (1944)*, pp. 18+).—The results of the extensive laboratory and field experiments of the station on the value of various liming and fertilizer materials for different crops and on the main soil types of Ohio are presented.

Inspection of legume inoculants, F. W. QUACKENBUSH, H. L. MITCHELL, and A. S. CARTER (*Indiana Sta. Cir. 302 (1944)*, pp. 7, illus. 1).—Report is made on tests of the effectiveness of 81 official samples of legume inoculants collected in 1944 and of growth promoting preparations.

## AGRICULTURAL BOTANY

Physical methods of sterilization of microorganisms, O. RAHN. (Cornell Univ.). (*Bact. Rev.*, 9 (1945), No. 1, pp. 47, illus. 6).—This review (nearly six pages of references) considers the mechanical causes of death in microorganisms and death by irradiation, desiccation, low temperatures, moist heat, and depression of surface tension.

A preliminary survey of some Aspergilli for their antibiotic activity, T. N. RAMACHANDRA RAO and K. K. IYA (*Jour. Sci. and Indus. Res.*, 3 (1945), No. 11, pp. 510-511).—This note refers to a study of the species of *Aspergillus* in comparison with *Penicillium notatum*.

Pesquisa da atividade antibacteriana com 180 amostras de *Aspergillus* Micheli, 1729 [Investigation of the antibacterial activity of 180 strains of *Aspergillus*], A. DA ROCHA FURTADO (*Mem. Inst. Oswaldo Cruz*, 41 (1944), No. 2, pp. 205-222; Eng. abs., p. 222).—As tested against *Staphylococcus aureus*, 25 strains exhibited high activity in the first or second assay and 32 partial activity in the first or second assay; 123 strains showed no antibacterial activity. The frequency of discrepancies in the results obtained from a single strain in two assays indicates the necessity of prolonging systematically the period of study at shorter intervals.

Atividade antibacteriana do *Aspergillus flavus* [Antibacterial activity of *A. flavus*], A. DA ROCHA FURTADO (*Mem. Inst. Oswaldo Cruz*, 41 (1944), No. 1, pp. 45-57, illus. 8; Eng. abs., p. 56).—Of 12 strains of this fungus studied, 10 exhibited antibacterial activity; time of observation and media used were found important in this respect.

*Aspergillus ustus*, J. M. KURUNG (*Science*, 102 (1945), No. 2636, pp. 11-12).—A preliminary report on an antibiotic isolated from culture filtrates of the fungus *A. ustus*, which is said to inhibit definitely the growth of *Mycobacterium tuber-*

**Lycopersicin, a fungistatic agent from the tomato plant,** G. W. IRVING, JR., T. D. FONTAINE, and S. P. DOORITTLE. (U. S. D. A.). (*Science*, 102 (1945), No. 2636, pp. 9-11, illus. 2).—The authors report isolating from the expressed juice of the Pan America tomato—a variety highly resistant to wilt caused by *Fusarium oxysporum* f. *lycopersici*—a preparation which, though still impure, possesses marked fungistatic activity toward the wilt fungus; this antibiotic—designated "lycopersicin"—occurs throughout the mature plant. A rapid and accurate method for assaying this activity, patterned after the cylinder-plate method now used for assaying penicillin and related antibiotics, has been developed and is described. By use of the standard and the standard curve described it has been possible to assay the various parts of different tomato varieties for lycopersicin activity at all growth stages. It is concluded from such tests that (1) of the varieties tested, including Bonny Best (highly susceptible), Rutgers and Marglobe (resistant), and Pan America and Red Currant (highly resistant), all contain the inhibitor; (2) lycopersicin activity, though absent in the seed, appears in seedlings germinated in darkness and in the plant within 8 hr. after planting; and (3) its concentration varies somewhat with the age of the plant and considerably with the plant part assayed.

**A search for virus-inactivating substances among microorganisms,** D. JONES, F. R. BEAUDETTE, W. B. GEIGER, and S. A. WAKSMAN. (N. J. Expt. Stas.). (*Science*, 101 (1945), No. 2635, pp. 665-668).—Isolations were made of 150 organisms—bacteria, actinomycetes, and fungi—from straw compost, manure, soil, drainage material, and soil enriched with virus concentrates and were tested for antivirus activity *in vitro*. Three of them gave indications of possible inactivation of some of the small pox virus and, in one case, of the laryngotracheitis virus. The active principle of one of these organisms was actinomycin A, an antibacterial substance known to be highly toxic to animals. The other two organisms were less extensively studied, and no claims as to their antivirus potentialities can at present be made.

**Cytoplasmic hybrids in *Penicillium notatum*,** C. C. LINDEGREN and H. N. ANDREWS (*Bul. Torrey Bot. Club*, 72 (1945), No. 4, pp. 361-366).—*P. notatum* is considered a form species rather than a true species. In nature many conidia usually germinate together and if the strains are compatible anastomoses immediately produce heterokaryons; here, heterokaryosis is an especially favored condition and opportunity is offered for continued increase in complexity of the thallus. In the laboratory, however, single conidia germinate on agar plates separately and cultures are selected which have originated from single conidia; many of them are homokaryotic, and this is especially true of fungi such as *Penicillium*, which has uninuclear conidia. The high lability of penicillin production, as shown by the authors' experiments on heterokaryons, suggests that in nature, where mixtures are the rule, little or no penicillin is produced; only in the laboratory where homokaryons are handled or when a single conidium falls on a plate (as in Fleming's original observation) can appreciable amounts of penicillin be expected. Nevertheless, it is believed that the possibility still exists of increasing the yields by making mixtures. Even if the isolation of a large number of forms of *P. notatum* should yield exceptionally effective penicillin producers, improvement of the culture is limited by the potentialities of the original isolate, because this so-called species is apparently incapable of mating and the authors' attempts at improvement by cytoplasmic mixtures have shown but little promise. The fact that some penicillin producers are still using their original cultures indicates that an extensive search has not resulted in discovering any greatly superior genotypes. It is suggested that the following procedure might yield improved forms: "It should be possible to find an ascogenous heterothallic *Penicillium* or *Aspergillus* with the ability to produce penicillin. Once this organism has been discovered its sexual mechanism can be exploited to produce different segregants,

and those which are best from the point of view of penicillin production can be mated with each other, as well as with widely different forms. This method has been used successfully with yeasts" (unpublished data by C. C. and G. Lindegren).

**A manual of the Aspergilli**, C. THOM and K. B. RAPER (*Baltimore: Williams & Wilkins Co., 1945, pp. 373+, illus. 76*)—This book, "definitely a manual, not a monograph," is based on comparative studies of thousands of strains of *Aspergillus* in culture; representative strains giving the range of morphology and biochemical activity in each species are maintained in the permanent collection of the U. S. D. A. Northern Regional Research Laboratory, Peoria, Ill. Consistent efforts have been made to obtain the organisms actually used by authors who have put forward new nomenclature; the manual thus seeks to present under species names only living cultures known to the authors, although it seemed advisable to make a few additions based on the literature. The Aspergilli have become increasingly important as responsible agents in a number of industrial fermentations; many of them are also being found capable of producing antibiotics, and their possible use in this field will undoubtedly be explored exhaustively. Recognizing that any species name for an *Aspergillus* appearing at any time in the literature may at some future time become important, an alphabetical check list of species and generic names found applied to Aspergilli is given, with the author, date, and place of publication, and an index reference to the page in the manual where data theron may be found. Both topical (pp. 289-318) and general (pp. 319-330) bibliographies are provided, and an author-subject index completes the volume.

**Melanopsamma ranjanii** sp. nov.: A new [fungus] parasite of *Selaginella*, A. K. MITRA (*Jour. Indian Bot. Soc.*, 23 (1944), No. 4, pp. 158-163, illus. 6).

**Importance of anatomy in systematics of Polyporaceae**, S. R. ROSE (*Jour. Indian Bot. Soc.*, 23 (1944), No. 4, pp. 153-157, illus. 10)—During systematic studies of this fungus group the author found anatomical characters an aid in differentiating species, supplementing those of the basidia and spores, and presents supporting evidence in a considerable number of species.

**Die Ölplanzen Mitteleuropas** [The oil plants of middle Europe], J. HACK-BARTH (*Stuttgart: IViss. VerlagsgeSELL., 1944, pp. 378, illus. 59*).—This monograph considers oil plants in the narrower sense and those furnishing oil for a wide range of applications, as well as plants from which oil is extracted as a byproduct.

**Contribuição ao estudo das plantas medicinais do Brasil**—"Maytenus obtusifolia" Mart [Contribution to the study of the medicinal plants of Brasil—*M. obtusifolia*], O. MACHADO (*Rodriguesia*, 9 (1945), No. 18, pp. 9-15, illus. 10).—Description and medicinal uses of this member of the Celastraceae.

**Flora and fauna of the Paradise Mine area, British Columbia**, G. C. CARI and G. A. HARDY (*Brit. Columbia Prov. Mus. Nat. Hist. and Anthropol. Rpt.* 1941, pp. C18-C38, illus. 2).—This contribution briefly describes the area, climate, and biotic areas and habitats and presents an annotated list of the plants and animals encountered, including information on the habitat of each.

**The flora of Oakland County, Michigan: A study in physiographic plant ecology**, M. T. BINGHAM (*Cranbrook Inst. Sci. Bul.* 22 (1945), pp. 155, illus. 33).—"A dual purpose has prompted the research culminating in this publication. For the botanist it is intended to serve as a survey of the ferns and flowering plants of Oakland County, Mich., and as a contribution to the developing pattern of knowledge of Michigan flora. For the amateur interested in native plants it is meant to serve as a guide, written from the historical and ecological points of view. Both botanist and amateur will recognize that plants assume greater significance as members of a vegetative community than as individual entities."

**The genus Carex in Tennessee**, J. K. UNDERWOOD (*Amer. Midland Nat.*, 33 (1945), No. 3, pp. 613-643, illus. 5).—An annotated list of species of this genus of

sedges, including information on habitats, frequency of occurrence, and localities from which reported. Keys to the sections and species are provided, and some general notes on the soils and topography of the State are presented, with an illustrative map.

*Juniperus virginiana*, *J. horizontalis*, and *J. scopulorum*.—IV. Hybrid swarms of *J. virginiana* and *J. horizontalis*, N. C. FASSETT. (Univ. Wis.). (*Bul. Torrey Bot. Club*, 72 (1945), No. 4, pp. 379-384).—Continued studies (E. S. R., 92, p. 637) indicate no intergradation between *J. virginiana* and *J. horizontalis* except where their ranges overlap. In the Driftless Area of Wisconsin the two species grow together, and in the same colony there may or may not be various intermediates. The most common one—described as *J. virginiana ambigens*—combines the habit of *J. horizontalis* with the foliage and fruit of *J. virginiana*. On the Maine coast, colonies nearer the range of *J. horizontalis* consist of individuals which are all creeping but which often exhibit some characters of *J. virginiana*. Colonies nearer the range of *J. virginiana* show all degrees of creeping to erect plants, with other characters of the two species occurring with little or no correlation of specific characters.

Poisonivy and poisonsumac, W. M. HARLOW (*Syracuse: N. Y. State Col. Forestry*, 1945, pp. 19+, illus. 10).—This informative bulletin (27 references) considers the names applied to poison ivy, identification of poison ivy and poison sumac including comparisons with other plants having similar leaves, the nature and location of the poisonous principle, so-called immunity to poisoning, some cases of poisoning by direct and by indirect contact, effective protective measures, efficacy of various treatments after exposure, poison ivy dermatitis, and eradicator measures.

Taxonomic and ecological work on the higher plants of Michigan, H. T. DARLINGTON (*Michigan Sta. Tech. Bul.* 201 (1945), pp. 59, illus. 11).—This account considers the earlier botanical explorations in the State, its climate and physiography, the division of the State into floral regions (including particular reference to those of special botanical interest—the dunes, jack pine plains, mountainous areas, island floras, lakes, and bogs), vegetative forms, important plant groups, economic aspects, changes in the flora due to civilization, floristic and ecological studies in Michigan since 1900, and changes in plant nomenclature. The bibliography covers 14.5 pages.

A technique for analysis of population density data, R. O. ERICKSON and J. R. STETIN (*Amer. Midland Nat.*, 33 (1945), No. 3, pp. 781-787, illus. 2).—The problem of the distribution of individuals of a plant species within a community has not received the same amount of recognition as other ecological problems. In this paper a statistical method is presented, discussed, and illustrated which is said to permit an estimate of economic density to be derived from noneconomic data.

Some ecotypic relations of *Deschampsia caespitosa*, W. E. LAWRENCE. (Oreg. State Col. et al.). (*Amer. Jour. Bot.*, 32 (1945), No. 6, pp. 298-314, illus. 11).—A study was made of 21 individuals representing 8 races of tufted hairgrass, clonal divisions of which were transplanted to three California stations at 100-, 4,600-, and 10,000-ft. (timberline) elevations, respectively; these races came from Lapland, Finland, southern Sweden, and a climatic transect across California from sea level to 10,000-ft. altitude. All European races became vegetatively apomictic (viviparous) in the transplant tests, though only half of the individuals were strongly so; this phenomenon is said to be unknown in the European habitats of the species or in the native California races. The bases of comparison used in the study were (1) individual and racial reactions in uniform environments and (2) environmental influence in comparing one individual in different environments; the former criterion reveals inherited characteristics and the latter the noninherited modifications. The plasticity of individuals and races is also hereditary. Vigor, floriferousness, earliness,

fruiting, survival, frost injury, and disease susceptibility were studied, and five ecotypes were recognized, viz, (1) a coastal ecotype of western North America from the maritime climate of northern California, (2) an upper montane Sierran ecotype from the cool montane or subalpine climate, (3) an alpine Sierran ecotype, (4) a cold temperate ecotype from northern Europe, and (5) a subarctic ecotype from Lapland.

All five ecotypes belong taxonomically to one subspecies *D. caespitosa* ssp. *genuina*; these morphologically similar ecotypes are differentiated physiologically with the result that they fit widely different environments. In this species, therefore, physiological differentiation has been independent of morphological differentiation. Taxonomically, three subspecies are recognized in western North America, viz, *genuina*, *beringensis*, and *holciformis*—all of which have been previously considered independent species. It is pointed out that *D. caespitosa* var. *maritima* may prove a fourth subspecies on this coast, and that *D. bottmica* is doubtless but a northern European subspecies of *D. caespitosa*. The individuals representing the five ecotypes came from climatically different areas and hence may be referred to as climatic ecotypes. Their distinctive genetic differences stand out in the comparison of their growth and reproductive behavior in each of the three climatic gardens used. The theory and practical application of the concept of ecotype should contribute much toward the solution of problems in natural and applied ecology. Various kinds of ecotypes are discussed. There are 26 references.

**The symbiotic performance of isolates from soybean with species of *Crotalaria* and certain other plants, J. K. WILSON ([New York] Cornell Sta. Mem. 267 (1945), pp. 20).**—Following a critical review of the literature, the author reports the results of tests to ascertain the ability of diverse strains of *Rhizobium* from nodules of soybeans to symbiose with 21 species of *Crotalaria* and certain other plants. Seedlings were grown for about 30 days in sterilized glass containers protected from contamination by cotton plugs and the roots examined for nodules, which were the criteria of symbiosis. Only 1 of the 21 *Crotalaria*s failed to symbiose with 1 or more of the 12 isolates used. One strain symbiosed with 17 of the 21 species; another, with only 5. Over 25 other species of legumes were exposed to these 12 isolates, but only 6 symbiosed with each isolate, and 1 symbiosed with only 1 strain; this was *Acacia baileyana*, which has been previously reported as a non-nodulating species. No strain was found specific for soybean, but some isolates therefrom appeared to meet the symbiotic requirements of more species of *Crotalaria* than did others. Nodules or lack of nodules on species of legumes other than the one from which the isolate came depended largely on the particular organism employed. If the name *R. japonicum* is used to designate the organism causing nodules on soybean, it should be understood that it refers not to one specific organism but to organisms having a wide range of salient characters and possessing the ability to effect nodulation on many species of legumes, of which the soybean is one.

**Origin of a toxicity to mycorrhiza in Wareham Heath soil, I. W. BRIAN, H. G. HEMMING, and J. C. McGOWAN (*Nature [London]*, 155 (1945), No. 3943, pp. 637-638).**—It has been shown by others that the failure of conifers in this area is associated with the development in the soil of a definite toxicity to the normal mycorrhizas on these trees. From the studies here briefly reported, it is deemed probable that this toxicity to mycorrhizal fungi and the generally low microbiological activity of this soil are due to accumulations of gliotoxin and other antibiotics produced by *Penicillium* spp. dominating its mold flora; only further investigation can lead to definite conclusions.

**Fungi and vitamins, L. E. HAWKER (*Roy. Col. Sci. [London], Sci. Jour.* 14 (1944), pp. 65-78).**—A lecture reviewing present knowledge (79 references) on the relations of fungi to vitamins and other growth substances, with some suggested practical applications.

The influence of manganese deficiency on the synthesis of ascorbic acid (vitamin C) in foliage of plants, P. M. HARMER and G. D. SHERMAN. (Mich. Expt. Sta.) (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 346-349, illus. 1; *abs. in Michigan Sta. Quart. Bul.*, 27 (1945), No. 4, p. 429).—From this investigation of the effects on spinach, oats, and Sudan grass of applying manganese sulfate and acetate and sulfur to alkaline organic soil, it is concluded that Mn plays an important role in synthesizing ascorbic acid in chlorophyll-bearing tissue, since plants growing on a soil deficient in available Mn contained less total and reduced ascorbic acid. Mn is important in maintaining a proper oxidative level for ascorbic acid, lack of a sufficient amount generally causing the oxidized form of ascorbic acid to increase and the reduced form to decrease. Application of available Mn or of S to a Mn-deficient soil significantly increased the ascorbic acid content of plants during periods of the year when such application caused a significant growth response. The ascorbic acid content of plants varied with weather conditions and season of year; this seasonal variation was probably due to nutritional factors.

A physiological separation of two factors necessary for the formation of roots on cuttings, J. VAN OVERBEEK and L. E. GREGORY (*Amer. Jour. Bot.*, 32 (1945), No. 6, pp. 336-341, illus. 6).—The Ruth Wilcox variety is a difficult-to-root white-flowered form of hibiscus not responding to regular auxin treatments. If, however, a shoot of an easy-rooting red hibiscus is grafted onto cuttings of the white form abundant roots are formed, provided the base of the white cuttings is treated with auxin. Without additional auxin, the grafted hibiscus shoot is incapable of producing roots. These experiments show that for root formation on the cuttings of the white form two factors are necessary, viz, auxin and a factor (or complex) present in the leaves of red hibiscus. The downward transport of the second substance takes place through the bark and is not strictly rectilinear. Only further research will tell whether the root-forming effect of red hibiscus leaves is hormonal or nutritional or both.

Colchicine as a growth stimulator, E. H. NEWCOMER (*Science*, 101 (1945), No. 2635, pp. 677-678).—In the author's tests of colchicine on seedling trees (species of *Quercus*, *Castanea*, *Corylus*), effective concentrations short of those necessary for producing polyploid cells are reported to have stimulated growth.

The inhibition of pollen production in ragweed by the use of chemical sprays, B. H. GRIGSBY. (Mich. Expt. Sta. et al.). (*Science*, 102 (1945), No. 2639, pp. 99-100).—The more fundamental problem concerning pollen is considered to be the development of some method of control not destroying the vegetative portions of the plants and not a hazard to animal life. The results of trials with a number of materials indicate that pollen production can be stopped with chemical sprays, but that most of those tried are more or less toxic to crop plants as well, at the concentrations used. Later tests in the greenhouse with 2,4-D and other similar compounds showed low concentrations to have a very pronounced effect on ragweed. Sprayed when young, no further elongation occurred (2 mo.) nor were flower spikes evident; furthermore, leaves present at the time of treatment remained green and older parts of the stem appeared normal. Field trials are to be made of these promising chemicals.

The supposed presence of formaldehyde-polymerizing enzymes in green leaves, W. E. FOSTER (*New Phytol.*, 44 (1945), No. 1, pp. 17-24).—The author reinvestigated but failed to confirm the claim that killed green tissues contain a thermolabile system capable of polymerizing formaldehyde to sugar; he reports never having observed any clear increase over the controls in the copper-reducing power of a green-leaf preparation to which formaldehyde had been added. A method of estimating formaldehyde in such systems is described; the figures obtained indi-

cate that the measurable consumption of formaldehyde which undoubtedly occurs is controlled by a thermostable rather than by a thermolabile system. Furthermore, there appeared to be no relation between the small formaldehyde consumption and the correspondingly large production of reducing substance. If, therefore, any of the aldehyde is converted into sugar, this must be in amounts so small that they are beyond ordinary methods of estimation. The experimental evidence is thus against the view that green leaves contain an enzyme system capable of catalyzing the conversion of formaldehyde into reducing sugar.

An apparatus for the growth of plants under controlled temperature levels, H. TINT (*Phytopathology*, 35 (1945), No. 7, pp. 511-516, illus. 3).—The apparatus described is said to permit investigation of plant development simultaneously at several temperature levels. The design allows temperatures in separate compartments to fluctuate within their respective levels in a manner resembling the normal diurnal range of temperature in the field under the influence of varying degrees of insulation. Details for construction are given; the cost of the materials is relatively low, and subsequent maintenance expenditures are negligible.

Plant growth, L. E. YOCUM (*Lancaster, Pa.: Jaques Cattell Press, 1945*, pp. 203+, illus. 41).—“This book has been written in an attempt to bring together the knowledge necessary to answer (as far as possible) the many technical questions which the plant lover may ask about growing plants. It is an attempt to make clear the ‘how and why’ of plant growth. The principles of the laws of nature as applied to plants growing in the soil are stressed. Many of the newer theories used in plant cultures are described; others, not so well established, are suggested as possible future developments. The illustrative material has been selected, when possible, because it is found around most homes and can be examined by the reader.”

Effect of selenious and selenic acids on development of plants, E. V. BOBKOV and N. P. SHENURENKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 46 (1945), No. 3, pp. 115-116).—Sand cultures proved more susceptible than soil cultures to the toxic effects of Se to millet and alfalfa; this result is accounted for by the ability of the soil to absorb Se and convert it into compounds unavailable to the plant. Among the compounds of Se, those with lower degrees of oxidation are said to be the more toxic to plants.

Studies in the metabolism of plant cells.—III, The effects of cyanide on the accumulation of potassium chloride and on respiration—the nature of the salt respiration, R. N. ROBERTSON and J. S. TURNER (*Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 1, pp. 63-73), illus. 8).—In this study (E. S. R., 93, p. 133) on cut carrot tissue it is shown that salt respiration—induced rapidly after adding salt to the water surrounding the tissue—is inhibited by cyanide; the ground respiration exhibited no inhibition whether or not salt was present. The initial absorption of electrolyte to equality of concentration inside and outside the cell was not prevented by cyanide, nor did it cause loss of the electrolyte already accumulated; cyanide, however, stopped the process of accumulation against a concentration gradient. These findings confirm the theory that in at least some tissues the process of accumulation derives its energy from the salt respiration. A process of general interest is discussed, viz., that whereby a different kind of oxidation system (probably cytochrome oxidase) is rapidly induced by applying a neutral salt to the tissue. The possibility that accumulation depends on a special energy-liberating process is considered.

On the sugar consumption and respiration of wheat roots at different pH values, H. LUNDEGÅRDH and H. BURSTRÖM (*Lantbr. Högsk. Ann. [Uppsala]*, 12 (1944-45), pp. 51-69).—Roots of wheat seedlings were found to accumulate glucose from the surrounding medium; this process was strongly retarded at pH values below 5 to 6 and ceased at pH 3.2. Below this value the epidermal cells were

disorganized, and as the power of accumulation decreased an exosmosis of sugar from the root commenced. All acid media (pH below ca. 3.6) consequently contain exuded sugar, which disturbs the determination of  $O_2$  consumption by Winkler's method. After due correction for such errors, no acceleration of respiration at low pH values of the medium was found. The apparent independence of the fundamental respiration of the root with respect to the pH of the medium is explained by the high buffering capacity of the tissues. The rapid decrease in glucose consumption with pH is believed due to the fact that growth intensity is regulated by the pH value of the surface layer of the root, which in turn is directly influenced by the medium, as was also the case with other processes located in the surface of the root, viz., anion respiration and glucose accumulation from the medium.

The location and state of rotenone in the root of *Derris elliptica*, F. A. GUNTHER and F. M. TURRELL. (Calif. Citrus Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 2, pp. 61-79, illus. 2).—When fresh and dried roots of derris were compared chemically, cells containing rotenone in the form of whole derris resin (extractives) were found to occur in the xylem rays and parenchyma, phloem parenchyma, and pericycle, and to be most numerous in the parenchyma of the phloem and of the xylem rays. Rotenone and starch were not found in the same cells. The derris resin occurred as discrete particles (globules) in partial solution in an ethereal oil; they ranged in size from  $0.8\mu$  to  $3.9\mu$  in diameter. Slowly hemolyzing saponins and sucrose were also shown to be present in the plant. Experimental evidence indicated that rotenone and other rotenoids do not occur in situ in glycoside combination. There are 42 references.

Hemicelulose de reserva no embrião de "Hevea brasiliensis" Mull.—Arg. [Reserve hemicellulose of the embryo of *H. brasiliensis*], F. R. MILANEZ (*Rodriguésia*, 9 (1945), No. 18, pp. 43-59, illus. 14).

Importance of oxygen supply in secondary dormancy and its relation to the inhibiting mechanism regulating dormancy, N. C. THORNTON (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 10, pp. 487-500).—The author concludes from a critical review of the literature (41 references) that secondary and even primary dormancy probably have their inception in the accumulation of intermediate products, formed by partial anaerobic respiration—which act as inhibitors because the oxidation system has been temporarily impaired through an insufficient  $O_2$  supply. The system is therefore unable to function in removing many products, such as acetaldehyde, reducing sugar, polypeptides, and no doubt many other substances in quantities so small that no attempt has been made to measure them. It is further believed that the structure of the seed coat, the extent and metabolic activity of tissue surrounding the developing seed, and external factors such as temperature, moisture, and  $CO_2$  so alter the amount of  $O_2$  available to the embryonic tissue that any degree of depth of dormancy may develop in the seed. Dormancy periods may be either short as in newly harvested pea or wheat seed or longer as in apple or pear seed, or they may be restricted to only one portion of the embryo as in tree peony seed. High temperature storage seems only to augment the dormant condition in the majority of cases because the hydrolyzing system remains active over and above the inhibited oxidation system, while low temperature storage not only alters the type of hydrolysis but retards the accumulation of inhibiting substance so that the metabolic activity may regain its normal activity. Removal of the seed coats tends to dilute the inhibiting substances by allowing a great increase in water absorption, thereby aiding a slow return to normal as shown by the slow abnormal growth of the plant.

Further studies on tyrosinase in aerobic plant respiration, E. M. WALTER and J. M. NELSON (*Arch. Biochem.*, 6 (1945), No. 1, pp. 131-138, illus. 3).—It is shown

that in slices of sweetpotato roots or white potato tubers, tyrosinase plays the role of a terminal oxidase. The monohydric phenol activity of this enzyme is important in the respiration of the cells in both cases; however, all the monohydric phenols tried—*p*-cresol, xylol, phenol, and tyrosine—were found able to act as substrates for the tyrosinase in sweetpotato cells in contrast to the cells of white potatoes where tyrosine but not *p*-cresol acted as the substrate. Monohydric phenols can serve as reservoirs for keeping the respiratory chain in sweetpotato cells supplied with the *o*-dihydric phenols acting as H carriers adjacent to the terminal oxidase, tyrosinase. The concentration of the monohydric phenols is a factor in the ratio of the rates of the oxidizing and reducing reactions occurring between the preceding part of the respiratory chain and the H carrier adjacent to the terminal oxidase.

The evolution of oxygen from suspensions of chloroplasts—the activity of various species and the effects of previous illumination of the leaves, J. KUMM and C. S. FRENCH. (Univ. Minn.). (*Amer. Jour. Bot.*, 32 (1945), No. 6, pp. 291-295, illus. 2).—The evolution of O<sub>2</sub> from illuminated suspensions of chloroplasts in solutions containing ferric oxalate and potassium ferricyanide was measured in chloroplasts from 22 species of higher plants. Many gave no reaction because of the presence of interfering substances—presumably tannins—that combine with the added iron to form highly colored compounds. Species giving the O<sub>2</sub> evolution reaction have roughly similar ranges of activity based on the amount of chlorophyll present. Various preparations of the same species gave as different activities as did preparations from assorted species; this may be due to the past history of the specimens, particularly in regard to exposure to light, which was found to increase the rate of O<sub>2</sub> evolution markedly as compared to that from plants kept in darkness before removing the chloroplasts. This increased activity of light-treated plants died away again when they were stored in darkness. It is suggested that the light effect is due to the accumulation of some unidentified intermediate of normal photosyntheses.

Photosynthesis and related processes, E. I. RABINOWITZ (New York: Interscience Pubs., 1945, vol. 1, pp. 559+, illus. 63).—Although many physiologists and chemists, as well as more recently the physicists, have attacked the problem of photosynthesis, progress toward its solution has been slow; the difficulties lie in both the physiological and the physical aspects; nothing similar to the mechanism has thus far been realized in photochemical experiments outside the living cell. It is hoped by the author that this book will help plant physiologists to judge critically the experimental results obtained by various physical methods and thus aid them in appreciating the usefulness of reaction kinetics and of the theory of fluorescence and sensitization in analyzing photochemical processes in the living cell. It is also hoped that the physicists and physical chemists investigating photosynthesis may be assisted in understanding its broad physiological background and in realizing its intimate association with the life processes in the plant organism. Following introductory chapters on the discovery of photosynthesis and its role in nature, the two main parts of the work deal with the chemistry of photosynthesis and related processes and with the chemistry and structure of the photosynthetic apparatus. Bibliographic references terminate the individual chapters, and author and subject indexes are provided.

Photosynthesis and growth, A. A. RICHTER, K. T. SUKHOUKOV, and L. A. OSTAPENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 46 (1945), No. 4, pp. 165-167).—On the basis of data derived from experiments with sunflower, corn, cucumber, *Nicotiana rustica*, and *Taraxicum kok-saghyz*, previous results with beet (E. S. R., 93, p. 261) were confirmed, viz., that the initial phases of photosynthesis, including CO<sub>2</sub> absorption and its reduction with evolution of O<sub>2</sub>, proceed independently of growth processes or of the distribution of organic matter within the plant.

**Photosynthesis and development of plants.** A. A. RICHTER, K. T. SUKHOVUKOV, and L. A. OSTAPENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 46 (1945), No. 1, pp. 40-41).—Experiments with 10 plant species belonging to 5 families led to the conclusion that the initial stages of photosynthesis, the assimilation of  $\text{CO}_2$ , and the elimination of  $\text{O}_2$  in a leaf are independent of the developmental stage of the plant, nor was there any correlation in these respects between the leaf and the reproductive organs of the plant.

**Saltants produced in the fungus *Chaetomium globosum* by monochromatic ultra-violet irradiation and a growth effect characteristic of wavelength.** A. L. McAULAY, N. J. B. PLOMLEY, and J. M. FORB (*J. Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 1, pp. 53-57, illus. 2).—Use of a refined technic, enabling the effect of irradiation on the individual fungus spores to be studied, produced saltations involving modifications of growth rate and form, mycelium, and perithecia, as well as a growth modification designated the K type. Mycelium from the irradiated spore frequently exhibited instability, having the capacity for development into more than one type of colony; this property was particularly marked for the K type. For equal lethal effects of irradiation, production of the K type amounted to 31.3 percent at 265  $\mu\text{m}$ , but less than 5 percent at 313 and 334  $\mu\text{m}$ , while production of saltants was independent of wavelength. A selective effect with wavelength was established for ultraviolet irradiation of biological material.

**On the adaptation value of the photoperiodic reaction.** A. I. POTAPENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 46 (1945), No. 3, pp. 119-121, illus. 1).—Such widely distributed spring weeds as *Chenopodium album*, *Imaranthus retroflexus*, *Polygonum lapathifolium*, *Bidens tripartita*, and *Panicum crusgalli* maintain even at high altitudes their capacity to respond to a shortened day by a strong increase in their developmental rate. The author's experiments in Michurinsk indicated that when grown on a long-day regime (16-17 hr.) these plants are capable of vegetative growth for about 3 mo.; their development was accelerated, however, by gradually reducing the day length, the highest rate of reproductive development being observed on the 14-13-hr. day. On a 14-10-hr. day these plants proved capable of developing seed within less than a month. It is suggested that the adaptation to a definite day length may serve as a regulatory agency, acquiring the importance of a supplementary adaptation. The implications of the findings are discussed briefly.

**The orientation of pollen tubes of *Vinca* in the electric current.** G. MARSH and H. W. BEAMS (*Jour. Cell. and Compar. Physiol.*, 25 (1915), No. 3, pp. 195-201, illus. 2).—The direct electric current caused germinating pollen tubes of Madagascar periwinkle to emerge from the entine on the side toward the cathode to a greater degree than in other directions and to grow predominantly toward it. No threshold for emergence or growth orientation was found down to a current density of  $8.5\mu\text{amp./sq. mm.}$ . The percentages of tubes emerging toward the cathode and growing subsequently toward it each increased with current density to a maximum at about  $550\mu\text{amp./sq. mm.}$ , then decreased to zero above  $800\mu\text{amp./sq. mm.}$ . Inhibition of growth toward the cathode began at about  $550\mu\text{amp./sq. mm.}$ ; toward the anode, at about  $800\mu\text{amp./sq. mm.}$ . The fall in potential across the cells due to the current at  $500\mu\text{amp./sq. mm.}$  was 59.6 mv.; at 800, it was 87 mv. Inhibition was reversible; cells showing no germination during exposure may begin to germinate and grow normally within 0.5 hr. after cessation of the current. No injury from the current was found up to  $1,430\mu\text{amp./sq. mm.}$  for 50 min. The data from different experiments exhibited considerable variation, due principally to the "negative group effect."

**Actinomycetes in various parts of the potato and other plants, B. F. LUTMAN** (*Vermont Sta. Bul.* 522 (1945), pp. 72, illus. 35).—Using potato plants, especially, but also several others, for comparison, the author attempts to establish the filamentous nature of the irregular lines which simulate cell walls when sections are viewed under the microscope. They correspond to Mangin's calcium pectate components (middle lamellae) and, with a few exceptions, appear identical with them. These filaments branch, seem to push into the cell lumen, and twist and bend in tortuous paths. They are usually about  $1\mu$  in diameter, but may be less. Their staining reactions indicate a pH of 5.0-5.2; potato tissue has a pH of 5.8-6.2. These reactions are in the second range of crystal violet dye—used in the gram stain—and result in the filaments staining dark blue while the potato tissue stains reddish violet. The potato scab actinomycetes are known to have a pH of about 5.0-5.2. Microchemical tests indicate these filaments to be protein in nature. In view of the known occurrence of actinomycetes in the outer layers of roots and tubers, the morphological resemblance of these filaments to actinomyces strands, and their protein nature corroborate the author's theory that they are actinomyces mycelium.

These filaments are especially abundant in the outer layers of the tubers and roots of potatoes, and the stems above ground are almost as completely infected. The tips of young roots and stems contain only a few strands between the cells. Leaves seem to be infected along the phloem of the leaf veins, with only occasional strands between the pulp and palisade parenchyma cells. Flower sections are generally infected. The nucellar tissue contains numerous strands, and egg cells are surrounded by strands. Pollen tetrads seem, in some cases, to be held together by them. If fertilization occurs, the resulting young plant would have little chance of escaping infection. These findings would seem to make the infection systemic and hereditary. Young plants grown from disinfected seed and in disinfected soil were found to contain numerous actinomyces filaments. The formation of an abscission layer in the flower pedicel is synchronized with the formation of egg mother cells and pollen. All cell walls of the pedicel are infected with actinomyces filaments. The first symptoms of abscission are swellings of the intercellular spaces at the outer margin of a swollen zone on the pedicel. Actinomyces filaments penetrate into these intercellular spaces. Similar swollen places are to be found near vascular bundles, with a similar penetration of filaments. It is suggested that an actinomyces may (under the proper stimulus, such as excessive heat) dissolve the intercellular pectins and cause blossom drop. Walls of regenerated cork cambium cells, on a cut tuber surface, become invaded very quickly by these filaments. Potato scab lesions are associated with strands of actinomyces extending from the abnormal cells of the cork cambium to the interior of the tuber. The relation of these internal strands to scabbing is not clear, since similar strands have been found in clean tubers grown on land never known to produce scabby tubers. The strands found under the scabs seem to be unusually large and numerous, especially those about 5-10 cells below the pathological tissue. It is suggested that potato leaf roll—the foliage stage of net necrosis in the tubers—may result from infection by actinomyces filaments. No artificial inoculations of leaf roll have ever been successful, but sucking insects carrying the virus sink their sucking tubes into the phloem of the leaf through the intercellular spaces.

The cell walls of Jerusalem-artichoke tubers and the enlarged roots of beets, carrots, parsnips, and turnips contain gram-positive filaments which, though varied in arrangement, seem quite conclusively to be of the same sort as those occurring in the potato plant. Though the role of actinomycetes on cell walls is as yet unknown, certain possible functions are suggested. Since large numbers of soil actinomycetes are pectin-dissolving, the different varieties found in various host plants may be closely related. It is believed from the results of this study that the walls

of the higher plants are living—not in the sense of Unger, Sachs, and Ursprung—but through the presence and action of strands of an actinomycetes or of actinomycetes. The effects of actinomycetes filaments surrounding every cell cannot, at this time, even be estimated, but it is believed that the materials which they withdraw from the cells and the products which they excrete and which must be absorbed by the cells cannot fail to change the characteristics of the cells.

Further experiments on torsions of leaves, R. Snow (*New Phytol.*, 44 (1945), No. 1, pp. 70-82, illus. 10).—It had been hoped to decide between the two main theories of the mechanism of torsion by means of experiments on distally fixed leaves, but actually in the experiments reported, although positive torsions (those tending at the start to bring the correct face uppermost) predominated—supporting the transverse growth theory—yet negative torsions were sometimes obtained, in the pulvini of *Phaseolus* and in the petioles of *Lunaria* and *Stachys*. In the pulvini they were obtained when leaves were not in organic continuity with the rest of the plant; in the petioles, under conditions which could not be determined. These negative torsions are discussed briefly, but further work is needed to interpret them; they indicate that the mechanism of torsion must be complicated. Evidence clearly tending to support the transverse growth theory was, however, obtained in the experiments on constrained leaves. As to the reorienting effect of auxin paste applied to one side of a petiole or pulvinus, further studies are needed to discover whether a connection can be found between this effect and the transverse growth theory.

Development of sexual and vegetative organs on detached forest tree branches cultured in the greenhouse, L. P. V. JOHNSON (*Forestry Chron.*, 21 (1945), No. 2, pp. 130-136).—Experiments on the relation of nutrient solutions to development of seeds on detached branches of *Populus grandidentata* showed distilled water to be superior to Hoagland's solutions, sucrose, or Hoagland's combined with sucrose, or to a peat humus infusion. A greenhouse environment simulating outdoor conditions in mid-May proved highly favorable to the development of flowers and seeds on detached branches of *Populus* and other forest trees cultured in water. Data are presented indicating the time at which various species of forest trees pass from a state of true dormancy to one imposed by the unfavorable winter environment; for most species this transition apparently occurred between the middle of November and the first of December. Greenhouse phenological records showed that the time required for flower development decreases progressively from the onset of imposed dormancy.

Glandular leaf hairs of oriental tobacco, N. J. BENTLEY and F. A. WOLF (*Bul. Torrey Bot. Club*, 72 (1945), No. 4, pp. 345-360, illus. 2).—Since the aroma of tobacco has been shown to arise primarily from the exudate of glandular hairs, it seemed desirable to acquire more knowledge of these hairs as a basis of attempts to increase the volume of this aroma. Chloroplasts within the gland cell or cells enable them to synthesize exudate in situ and eventually to excrete it; these processes may continue throughout the entire functional period of the leaf. The exudate from different varieties was found quite unlike as judged by the sense of smell. The density and total number of the hairs per leaf differed according to the variety in the oriental tobaccos studied; these differences proved subject to modification and control by the interrelated action of hereditary and environmental factors. Present observations indicate that partial separation of such interaction can be accomplished. Differences in hairiness between individuals arising from the same seed plant indicate that this character may be increased by selection. As to environmental influences, a single variety when grown under glass in winter was much less hairy than when grown in the field during summer. Furthermore, many more hairs per leaf were produced when plants of a variety

were widely spaced than when grown closer together; the leaves on widely spaced plants may also be 2 to 3 times larger than those on the closely spaced, but the population of hairs per unit area in the former is very markedly less. The number of hairs on leaves along the basal part of the stalk and near the tip always differed from that of leaves along the main portion of the stalk. Hairiness was also greater with increased illumination. As having a bearing on nutrition, the observations show that tobacco plants grow more rapidly and are larger when supplied with readily available nutrients; such larger plants with the larger leaves have the greater number of hairs. Determinations of the density of the hairs on leaves, total hair population, and leaf area indicate for the widely spaced v. the closely spaced plants the existence of a pattern of hairiness. Insofar as hairiness is correlated with time of maturity of a variety, with leafiness, and with desirable leaf size, it appears to be a criterion for evaluating the leaf prior to curing. Further knowledge of the environmental influences on hairiness should be sought.

On the working conditions of the foliage as a factor of differentiation of laticiferous vessels in kok-saghyz roots, A. A. NICHITOROVICH and E. F. IVANITZKAYA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 46 (1945), No. 1, pp. 36-39).—In experiments with kok-saghyz plants, the rhythm of differentiation of the rings of laticiferous vessels in the roots was uniform and did not depend on the growth conditions of the roots. The rate of formation of the rings varied with the growth rate of the plants themselves. Though the rhythm of formation of the rings had considerable stability and independence of external influences, the intensity of formation of the laticiferous vessels within an individual ring was variable and appeared to be greatly influenced by the developmental condition and by the foliage function. The total rubber content of the vessels was closely linked with their diameter, this increasing with the age of the plant and with the bettering of nutritional conditions. These simple relations are, however, obscured by a number of other influences. The data suggested that the diameter of the laticiferous vessels and their abundance within the rings is highly variable both phenotypically and genotypically, thus opening up opportunities for improvement by breeding and by designing better conditions of culture. The evidence at hand also indicated that not only the age of the plant as such is important but also the degree of maturity of the leaves. The presence of mature leaves insured a better filling of the laticiferous vessels with rubber; on the other hand, the preservation of young leaves—under normal light and carbon nutrition—resulted in a more intense formation of these vessels, which were, however, less filled with rubber.

## GENETICS

[Plant genetics research] (*Genetics*, 30 (1945), No. 1, pp. 1, 2, 3, 5-6, 8, 9-10, 12-13, 14-15, 18-19, 23-24, 27).—Abstracts of papers prepared for the 1944 meetings of the Genetics Society of America at Cleveland, Ohio, include Interaction of Genes for Size and Form in Maize, by E. C. Abbe and B. Plinney (p. 1), and Chromosome Disjunction in Maize Interchanges, by C. R. Burnham (p. 2), (both Univ. of Minn.); Preliminary Report on Meiotic Chromosomes in New *Datura* Hybrids From Embryos Excised From Incompatible Crosses, by J. M. Smith (p. 3); An Experimental Study of Somatic Pairing, by M. E. Gaulden (p. 5); Evolutionary Patterns in the Genus *Cuthbertia*, by N. H. Giles, Jr. (pp. 5-6); The Effect of Ultraviolet Radiation and X-Rays on Mutation Production in *Penicillium notatum*, by A. Hollaender and E. M. Zimmer (p. 8); Evolution and Domestication of Cotton, by J. B. Hutchinson, A. Silow, and S. G. Stephens (pp. 9-10); Inheritance of Hard-Shell in Beans, by G. A. Lebedeff (pp. 12-13).

(Ga. Expt. Sta.) ; The Artificial Synthesis of *Triticum spelta*, by E. S. McFadden and E. R. Sears (p. 14) (U. S. D. A. and Tex. and Mo. Stas.) ; New Hybrids With the Aberrant Species *Datura ceratocaula* Secured by Embryo Dissection, by S. W. McLean (pp. 14-15) ; The Frequency of Plants With Small Chromosomes in Three Populations of *Tradescantia paludosa*, by H. P. Riley (p. 18) (Univ. Ky.) ; Some Known and Probable Levels of Reciprocal Introgression Between Guayule (*Parthenium argentatum*) and Mariola (*P. incanum*), by R. C. Rollins (pp. 18-19) (U. S. D. A.) ; Reduced Chromonema Elongation and Abnormal Spiraling Following X-Ray Treatment of Meiotic Chromosomes, by A. H. Sparrow (p. 23) ; Gene Variability in Maize-II, The Action of Certain *R* alleles, by L. J. Stadler and S. Fogel (pp. 23-24) (U. S. D. A. and Univ. Mo.) ; and Studies on Assay and Inheritance of the Marihuana Drug, by H. E. Warmke (p. 27).

**Experimental studies on the nature of species.—II.** Plant evolution through amphiploidy and autopolyploidy, with examples from the *Madiinae*, J. CLAUSEN, D. D. KECK, and W. M. ILIESKY (*Carnegie Inst. Wash. Pub.* 564 (1945), pp. 174+, illus. 86).—In this installment of the monograph series<sup>2</sup> "the objective has been to bring into a new focus the broad picture of species building in plants by amphiploidy and autopolyploidy. This aspect of plant evolution has received repeated treatment in the past, and the present volume does not attempt to exhaust the subject. Rather, this account aims to present the pattern of organization in nature as disclosed by experimental polyploidy and through the application of biosystematic principles. On the background of their own experiments, the authors venture to assemble much representative material from contemporary literature [over nine pages of references] and examine the evolutionary patterns thereby disclosed." A chapter each is given to *Madia nutrammii*, *M. citrigravilis*, and *Layia pentaglossa*, and the remaining chapters deal with biosystematic relationships and amphidiploidy, classification of experimental polyploids on biosystematic principles, ecologic characteristics of natural amphiploids and of autopolyploids, and taxonomy and evolutionary aspects of amphiploidy and autopolyploidy. An author-subject index is provided.

**Factor Z<sub>2</sub> and gametic reproduction by Phycomyces**, W. J. ROBBINS and M. B. SCHMITT (*Amer. Jour. Bot.*, 32 (1945), No. 6, pp. 320-326, illus. 4).—Failure of the fungus *P. blakesleeanus* to form progametes at 26° C. on a basal medium of mineral salts, asparagine, dextrose, and thiamine was found due to the development of too much acidity before the (- -) and (- -) strains grew together. Addition of a potato extract or of neutralized protein hydrolysates, neutralized glutamic acid, or other organic acids favored gametic reproduction because these supplements buffered the medium or increased the growth rate so that the mycelia met before the critical H-ion concentration was reached. The production of acid was slower at 20° than at 26°, which accounted for the favorable effect of the lower temperature on gametic reproduction. Factor Z<sub>2</sub> for gametic reproduction by *Phycomyces* is thus not a specific substance, but is any condition allowing the mycelia to join before the critical H-ion concentration has developed in the medium.

**Vitamin-synthesizing deficiencies in yeasts supplied by hybridization**, C. C. and G. LINDEGREN (*Science*, 102 (1945), No. 2637, pp. 33-34).—The authors demonstrate experimentally that a vitamin-synthesizing deficiency in yeasts (*Saccharomyces* spp.) can be supplied by hybridization, and that the heterozygote usually synthesizes the vitamin nearly as well as the homozygote.

**Interspecific hybridization in Parthenium.—I, Crosses between guayule (*P. argentatum*) and mariola (*P. incanum*),** R. C. ROLLINS. (U. S. D. A.) (*Amer. Jour. Bot.*, 32 (1945), No. 7, pp. 395-404, illus. 11).

<sup>2</sup> *Carnegie Inst. Wash. Pub.* 520 (1940), pp. 452+, illus. 155.

**Mutations of bacterial viruses affecting their host range, S. E. LURIA** (*Genetics, 30 (1945), No. 1, pp. 84-99, illus. 1*).—From two bacterial viruses of *Escherichia coli*,  $\alpha$  and  $\gamma$ , two new viruses  $\alpha'$  and  $\gamma'$  were isolated, differing from  $\alpha$  and  $\gamma$  in their ability to attack *E. coli* strains which by mutation had become resistant to virus  $\alpha$  or virus  $\gamma$ . "An analysis of the distribution of the particles of a new virus in a series of similar cultures of normal virus proved that the new virus arises by mutation from the particles of normal virus in the course of their growth on sensitive bacteria. Each mutant is indistinguishable from its parent virus in serological properties and in its activity on the common bacterial host. The latter property was utilized to study the interference between similar virus particles. The results confirmed the conclusion that only one of the infecting particles succeeds in growing in each bacterial cell. The mutant viruses are poorly adsorbed by their new hosts. Their growth on these was investigated. The sensitivity of a series of bacterial mutants to viruses  $\alpha$ ,  $\alpha'$ ,  $\gamma$ , and  $\gamma'$  was studied. It was found that resistance to virus  $\alpha$  may be brought about in the same bacterial strain by different mutations. These lead to differences in sensitivity to the related virus  $\alpha'$  and in other physiological properties. Bacterial mutations leading to resistance to a mutant virus lead also to resistance to the parent virus. Bacterial mutations leading to resistance to unrelated viruses generally prove independent; the same mutation can occur in strains with a different history of previous mutations. One exception to the independence of various mutations was found. A bacterial strain resistant to viruses  $\alpha$  and  $\alpha'$  reverted to sensitivity as a consequence of a mutation to resistance to viruses  $\gamma$  and  $\gamma'$ ."

**Abnormal segregation during megasporogenesis in maize, A. E. LONGLEY.** (U. S. D. A.) (*Genetics, 30 (1945), No. 1, pp. 100-113*).—Cytogenetic data confirmed studies of Rhoades<sup>8</sup> on preferential segregation at megasporogenesis of the abnormal type of chromosome 10 in corn. In addition it was shown that when this preferential segregation occurs in megasporogenesis there will be a preferential segregation of the knobbed over the knobless type of other chromosomes heterozygous for knobs. The effect of preferential segregation is apparent as aberrant genetic ratios obtained when loci of segregating alleles are near the locus of the segregating knob. The amount of aberrance may be used as a measure of the distance between a knob locus and the locus of segregating alleles. Preferential segregation may result in the associated inheritance of genes located on different chromosomes, termed "false linkage." "Since preferential segregation of the abnormal type of chromosome 10 tends to concentrate knob-bearing chromosomes in the megasporangium, it may be predicted that abnormal chromosome 10 generally will be found in maize strains with a large number of knobs."

**Hybridization and genetics in *Ustilago hordei* and *U. nigra*, W. M. BLAVER.** (U. S. D. A. and Idaho and Wis. Expt. Stas.). (*Jour. Agr. Res. [U. S.], 71 (1945), No. 2, pp. 41-59, illus. 4*).—The optimum temperature for chlamydospore germination in *U. nigra* and *U. hordei* ranged from 24° to 28° C., those of *U. hordei* germinating over a wider range; at 36°, *N. nigra* failed to germinate at all. *U. hordei* hybridized readily with *U. nigra*, as was shown by sporidial fusion in culture and by production of hybrid chlamydospores in the host. Interspecific crosses and backcrosses failed to show simple mendelian inheritance of chlamydospore markings or pathogenic properties, nor did the type of smutted head segregate in any such ratio. The smutted heads produced from a monosporidial interspecific cross ranged in the F<sub>1</sub> from almost typical *U. nigra* to the *U. hordei* type. Backcrosses of the interspecific hybrids on the *U. hordei* parent tended to produce smutted heads of *U. hordei* type; in contrast, backcrosses of

<sup>8</sup> *Genetics, 27 (1942), No. 1, pp. 395-407, illus. 4.*

the interspecific hybrid on the *U. nigra* parent produced smutted heads ranging from true *U. nigra* to true *U. hordei* types. In the F<sub>1</sub> of the interspecific hybrid there was some correlation between chlamydospore markings and type of smutted head. Most smutted heads of *U. nigra* type had echinulate spores, whereas those of *U. hordei* type had smooth or echinulate spores with approximately equal frequency. Evidence was secured that the range of virulence of *U. nigra* and *U. hordei* may be combined through hybridization, thus forming new physiologic races. There are 38 references.

**Endomitotic tapetal cell divisions in Spinacia.** E. R. WITKUS (*Amer. Jour. Bot.*, 32 (1945), No. 6, pp. 326-330, illus. 20).—The tapetal cells of pricklyseed spinach undergo two divisions during meiosis, both occurring while the sporocytes are in the zygotene synizesis stage. The first division may be one of three types: (1) Normal mitosis may take place but no cell plate is formed and a binucleate cell results. (2) The nucleus may undergo an abnormal mitosis due to the presence of sticky chromosomal bridges; as a result a uninucleate cell is formed with a dumb-bell-shaped nucleus. (3) The cell may undergo a type of division new to tapetal cell cytology, called endomitosis. The endomitotic cycle consists of endoprophase, endometaphase, endoanaphase, and endotelophase. The chromosomes undergo contraction to the metaphase condition, the spindle attachment regions divide, and the daughter chromosomes separate slightly and revert to the resting stage condition. Throughout the whole process the nucleolus is present, the nuclear membrane remains intact, and there is no spindle and consequently no true anaphase movement of the chromosomes. Thus all the chromosomes remain in the same nucleus, increasing the degree of polyploidy. The resulting nuclei may remain in the resting condition or undergo a second division; the latter is always endomitotic. The cell resulting from this division is either a uninucleate octoploid cell, in which case the nucleus is dumb-bell-shaped, or a binucleate cell with two tetraploid nuclei. It appears possible that endomitosis may not be peculiar to the tapetal cells of *Spinacia*, but may have a wider application and may explain many of the cytological phenomena occurring in the tapetal cells of other plants—phenomena up to now obscure.

**Cytology and breeding behavior of selected plants of Poa pratensis.** E. L. NIELSEN. (U. S. D. A.). (*Bot. Gaz.*, 106 (1945), No. 4, pp. 357-382, illus. 53).—Germination studies indicated wide average differences among bluegrass plants in number of seeds set and viability of such seeds, although most plants produced seed of good viability. Poor seed set of some plants was due to frequent collapse of the developing macrosporocyte during or just after meiosis. Significant differences in the amount of such sterility was determined for between-progeny comparisons. In 41 progenies grown from as many plants of four related parental families, frequencies of aberrant plants among second-generation individuals varied from 0 to 100 percent. No direct relation was apparent between the morphological characteristics of parent plants and the breeding behavior of their progenies, and this also appeared true for other characters, as seed set and germination. Globular inclusions, occurring in the developing microsporocytes of all plants, were particularly prominent during the anaphase and telophase stages, although evident in all stages from prophase through the quartets. Highly significant differences generally were found in microsporocytes in the frequency of laggards among plants, but not always.

**An analysis of the genic or cytoplasmic basis of heterosis.** J. W. GOWEN. (Iowa State Col.) (*Genetics*, 30 (1945), No. 1, p. 7).—Crosses of inbred races of *Drosophila* were analyzed to show the contributions of each to (1) general high-yielding ability of all hybrids with which it was crossed and (2) special ability to transmit high yield when crossed with particular races. The contributions of each chromosome group to vigor was ascertained by analyzing and re-

combining chromosomes comprising the inheritance in all 27 possible ways. Variations of genetic origin were properly segregated from those that were environmental. The results show that hybrid vigor is genetic in origin rather than due to cytoplasmic differences. Certain inbred strains contain genes generally effective in causing heterosis in their crosses. Other inbreds contain genes specific or limited in their effectiveness to particular combinations. A redistribution of the hybrid effect by chromosomes shows that it is due to a fairly large number of genes distributed at random over the chromosome pairs.

**Heteropycnosis as a means of diagnosing sex,** S. G. SMITH (*Jour. Hered.*, 36 (1945), No. 7, pp. 194-196, illus. 1).—Somatic heteropycnosis is suggested as possible for sex diagnosis in budworm larvae. The sexual diagnosis is thus made before differential mortality may distort the primary sex ratio. In about 400 embryos hatched, there were 226 with heteropycnosis and 173 without this condition. A *P* value for the sex ratio of about 0.01 was obtained.

**Bicornual pregnancy in a mare,** C. K. WHITEHAIR and G. R. SPENCER. (Univ. Wis.). (*Cornell Vet.*, 35 (1945), No. 1, pp. 66-67, illus. 1).—A mare which was 13 days overdue to foal was found on post mortem to possess a fetus in a U-shape, with the ends projecting into both horns of the uterus, and both horns rotated on a transverse axis upward and backward, so that the ends of the uterine horns projected to the pelvis of the mare.

**A probable allelic series of genes affecting cellular antigens in cattle,** C. STORMONT, M. R. IRWIN, and R. D. OWEN. (Univ. Wis.). (*Genetics*, 30 (1945), No. 1, pp. 25-26).—The cellular antigens recognized in the red blood cells of cattle (E. S. R., 92, p. 639) have been increased to 40, although each of the antigens appears to be an immunological entity. Certain of them are not genetically independent. The antigen characters called *B*, *G*, and *K* have appeared only as *B* alone, *G* alone, *BG* together, and *BGK* together, or the absence of all three. Thus *K* has been found only in the simultaneous presence of both *B* and *G*. Of 2,031 cattle tested, there was only one exception in 633 individuals containing *BGK*. Genetically there appeared to be two kinds of individuals carrying both *B* and *G*. They may be differentiated by mating the hybrids to animals not containing either character—the progeny carrying both genes or neither in one group, and in the second group those whose offspring possessed only either *B* or *G*. The results obtained suggest that a single gene may produce the two antigens *B* and *G* singly or in combination. These are immunologically indistinguishable. The possibility of linkage cannot be excluded, but it is suggested that these antigens are produced in a multiallelic series—one for the absence of all three antigens, one for antigen *B*, one for *G*, one for *B* and *G* together, and one for the *BGK* complex.

**Herd size and its genetical significance in pedigree cattle breeding,** H. P. DONALD and A. A. EL ITRIBY (*Jour. Agr. Sci. [England]*, 35 (1945), No. 2, pp. 84-94, illus. 1).—Of the herds listed in 1939, 15 to 20 percent made no herdbook entries and were much smaller than the average size of animals in the various breeds. The average number of cows in the Jersey, Guernsey, and Red Polled herds, excluding nonregistered animals, was 29, 26, and 49, respectively. It is estimated from the data that about 3.5 to 4 percent of all cows in calf or in milk (including heifers in milk) in England, Scotland, and Wales were pedigreed. The Irish herds of Shorthorn, Aberdeen Angus, and Hereford cattle averaged 10 or fewer ♀♀. Welsh herds of Herefords, Shorthorns, and Welsh Blacks averaged about 20 ♀♀. The largest averages were found in Scottish Ayrshires (76), English Ayrshires (62), Lincoln Red (46), and Red Polled (46) herds. Probably 90 percent of the Irish and more than half of the other herds consisted of less than 12 cows and heifers with calf. There were only about 420 pedigreed herds in 1939 which contained 50 or more cows and heifers which calved. Some 200 of these were

Ayrshire herds. Excluding the very small herds, the average pedigreed herds were a little larger than the nonpedigreed herds. From this study it is concluded that a large proportion of all pedigree breeders are affected by the limitations of the small herd, chiefly in connection with outcrossing and frequent bull sampling, random fluctuations in gene frequency, and the difficulty of adequately applying progeny testing. To avoid these difficulties, it is suggested that whole breeds or localized subdivisions of breeds be used.

**Observations on the clinical aspects of reproductive disorders in cattle,** J. G. WRIGHT (*Vet. Rec.*, 57 (1945), No. 26, pp. 313-318).—Reproductive disorders are classified under the general headings of failure to ovulate and infectious diseases of the genital organs.

**Observations on the survival time of the spermatozoa in the genital tract of the cow and its relation to fertility,** J. A. LAING (*Jour. Agr. Sci. [England]*, 35 (1945), No. 2, pp. 72-83, illus. 8).—In a further study of the survival of spermatozoa (E. S. R., 93, p. 562), no reliable results were obtained on the period of survival of spermatozoa in the reproductive tract of 2 cows and 3 heifers killed at various intervals after insemination. In 4 cows and 1 heifer given pregnant mare serum followed by pregnancy urine, 1 ovulated. One animal with a large follicle and given pregnancy urine ovulated, but this could not be definitely attributed to the treatment. Of 5 cows and 29 heifers inseminated with known numbers of spermatozoa at various times toward the end of estrus, inseminations earlier than about 16 hr. before the end of heat were infertile. Those made between 16 h. before the end of heat and the cessation of heat were all fertile. The lack of mating determined the end of the heat period. Ovulation had not occurred in 7 animals slaughtered at various times from 43.5 hr. to 14 days post-estrus. In six of seven cases ovulation followed the expelling of the corpus luteum. The survival of sperm was about 16 hr. plus the interval between the end of heat and ovulation. It is suggested that the fertility of inseminations performed soon after the end of heat depends on ovulation occurring sufficiently late for the spermatozoa to reach the ovum before it dies. Numerous spermatozoa could be seen in the zona pellucida of many fertilized ova, but none were present in unfertilized ova. The relationship of survival time of the spermatozoa to fertility in different seasons of the year is discussed.

**Age variation of skin in karakul lambs,** V. A. SHOROKHOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 45 (1941), No. 9, pp. 393-395).—Age variations in the histological structure of the skin of male Karakul lambs from birth to 31 days of age were investigated. Bits of skin from the sacral region of 38 lambs were fixed with 10 percent formalin. Each day of development was represented by one to two samples. The skin of the 1- to 3-day-old lamb consists of epidermis, corium, and subcutaneous fat tissues. These tissues are in layers of cells, the epidermis increasing from two to five layers during the first month. The relations of the changes in the tissue structure to the character of the hair and curl were observed.

**Inheritance of coat color in swine.—II, Results of Landrace by Poland China crosses,** II. O. HETZKEK (U. S. D. A.) (*Jour. Hered.*, 36 (1945), No. 6, pp. 187-192, illus. 3).—Continuing the study of the inheritance of the major colors of swine (E. S. R., 93, p. 421), an analysis of genetic differences between the Danish Landrace and the Poland China pattern is reported, based on 146 all-white F<sub>1</sub> progeny of 5 Poland China boars mated with 15 Landrace sows and their descendants. The results showed the dominance of Landrace white. There were produced 157 F<sub>2</sub> pigs by 5 of the F<sub>1</sub> sows mated with 2 F<sub>1</sub> boars, and a total of 230 backcross pigs from 4 Poland China boars mated with 17 F<sub>1</sub> sows. When classified according to the presence or absence of black, the F<sub>2</sub>s total 126 white and 31 black, while the backcross to Poland China boars gave a total of 114 white and 116 black progeny.

It seemed evident that the absence of black is due primarily to a single dominant factor possessed by the Landrace. Other topcrosses and backcrosses involving the production of a total of 2,079 pigs were in close harmony with the hypothesis that one major gene determines black or white pigmentation. Separation by sex gave no significant differences, showing that the control of black and white was autosomal. For reasons to be given in later papers, Landrace self-white is explained on the basis of a dominant epistatic gene to Poland China black, which operates as an inhibitor rather than an allele of the gene for black. The Landrace white and Poland China black are genetically different in regard to a fundamental gene which affects the production of color, but both breeds carry the same fundamental gene for black. The assumed formulas for these breeds are Landrace  $E_p\ E_p\ I\ I$  and for the Poland China  $E_p\ E_p\ i\ i$ , where  $E_p$  is the symbol for partial extension of black and  $I$  and  $i$  are the symbols for white and color, respectively. The whites included some with spots of black in the skin, while the blacks were more or less spotted. Most of these had a white ground color, but some showed red roan in addition to the white.

**Occurrence of red-eye in swine**, E. ROBERTS. (*Univ. Ill.*). (*Jour. Hered.*, 36 (1945), No. 7, pp. 207-208, illus. 2).—Two red-eyed individuals occurred in a litter of nine registered Hampshires. The black of the red-eyed individuals was diluted to a light sepia somewhat similar to the light sepia previously noted in a Poland China swine by McPhee and Zeller (E. S. R., 55, p. 327). Further studies are being made on the inheritance of red-eye and its effect on other colors.

**Practical anatomy of the rabbit: An elementary laboratory text-book in mammalian anatomy**, B. A. BENSLEY, rev. and edited by E. HORNE CRAIGIE (*Philadelphia: Blakiston Co., 1945, 7 ed., rev., pp. 358+, illus. 122*).

**On the physical basis for genetic resistance of mice to mouse typhoid**, E. F. OAKBERG and J. W. GOWEN. (*Iowa State Col.*). (*Genetics*, 30 (1945), No. 1, p. 16).—The significant differences between the leucocyte counts of susceptible and resistant strains in mice to mouse typhoid, noted by Gowen and Calhoun (E. S. R., 89, p. 528), were extended to include changes in the cells of the liver and spleen. The same six strains of mice varying in susceptibility showed that the liver lesions progressed rapidly in the susceptible mice. In the more resistant mice the liver lesions progressed more slowly but were larger with yellow-white areas of focal infection. The resistant strains showed few or no clean lesions.

**"Pig jaw" in Cocker Spaniels: Retrognathia of the mandible in the Cocker Spaniel and its relationship to other deformities of the jaw**, J. M. PHILLIPS (*Jour. Hered.*, 36 (1945), No. 6, pp. 177-181, illus. 2).—Numerous outcropping of pig jaw (pronounced undershot) in a strain of Cocker Spaniels suggests that the condition is inherited and due to one or more recessive genes with modifying factors. The condition appears to be partially lethal.

**Crooked neck dwarf in the domestic fowl**, V. S. ASMUNDSON. (*Univ. (Calif.)*). (*Jour. Hered.*, 36 (1945), No. 6, pp. 173-176, illus. 3).—An autosomal recessive lethal mutation in the New Hampshire fowl, differing from the other 19 lethals in the fowl reported by Lerner (E. S. R., 92, p. 33), and causing a marked dwarfsing in 21-day-old embryos, a slight reduction in the upper beak, a crooked neck, absence or marked reduction in the sternum, pectoral and leg muscles, and some reduction in the long bones, is described. Varying edema from about the eleventh to the thirteenth day occurred, and there was little increase in weight in dwarf embryos after the sixteenth day of incubation. Dwarf embryos were unable to make the vigorous movements characteristic of normal embryos at hatching or to pip the shell. The weights of the normal and dwarf embryos differed little before the twelfth day of incubation. Growth of dwarfs virtually ceased by the sixteenth day. These findings were based on about 300 normal and 100 dwarf  $F_2$  embryos. The

dwarfing described in this paper differed from that noted by Upp (E. S. R., 72, p. 171) in that the anatomical abnormalities did not occur.

Another breed of fowls characterized by a heterozygous phenotype, F. B. HUTT. (Cornell Univ.). (*Genetics*, 30 (1945), No. 1, pp. 10-11).—The Erminette breed of fowls, which is predominantly white with an admixture of enough black feathers to give a variegated plumage somewhat similar to Exchequer Leghorns, was found to be heterozygous for an autosomal gene. Erminettes mated inter se gave 1 white : 2 Erminette : 1 black. Typical Erminettes are produced by mating together two of the undesirable types (black  $\times$  white).

Rumplessness of chicken embryos produced by the injection of insulin and other chemicals, W. LANDAUER. ([Conn.] Storrs Expt. Sta.) (*Jour. Expt. Zool.*, 98 (1945), No. 1, pp. 65-77).—Various chemical substances were injected into the yolks of Single-Comb White Leghorn eggs prior to incubation, with the result that 2 units of zinc-free Iletin (Lilly insulin) caused  $41.6 \pm 3.8$  percent of all embryos surviving the seventeenth day to be rumpless, but only  $1.5 \pm 0.7$  percent of the controls were rumpless. Of the eggs of creeper fowls similarly treated with insulin,  $17.1 \pm 2.1$  percent were rumpless. Significant increase in rumplessness also resulted from injections of the eggs with cysteine hydrochloride, cystine, dl-glutamic acid hydrochloride, thioglycolic acid, and l-malic acid. The effect of l-glutamic acid hydrochloride was much less pronounced than that of the dl form. No effect was produced from d-malic acid. Some increase in rumplessness was probably caused by concentrated hydrochloric acid, but this was not true for more dilute hydrochloric acid. No effect resulted from injections of saline or the mere insertion of a hypodermic needle. No increase in abnormalities other than rumplessness was noted. Over 500 eggs of the Single-Comb White Leghorn and the creeper fowl were used with each of the chemicals.

Recessive rumplessness of fowl with kypho-scoliosis and supernumerary ribs, W. LANDAUER (*Genetics*, 30 (1945), No. 3, pp. 301-302).—A new type of skeletal mutation is described in which the pygostyle and caudal vertebrae may be entirely absent or rudimentary and fused into a bony knob. Conditions may modify the appearance of the tail feathers, which may simulate the appearance and modifications of dominant rumplessness, but the new mutation may be distinguished from dominant rumplessness by several characteristics. Rudimentary caudal vertebrae frequently have the appearance of lateral compression and show marked lordosis. In many cases there is a synsacral kyphoscoliosis of varying degree, with the compensatory thoracic or synsacro-thoracic scoliosis in the opposite direction. Certain other abnormalities are described. Sex may modify the mutation, as in ♂♂ the whole syndrome tends to find more frequent and more severe expression. Some variations, particularly in different stocks, are noted and some of the genetic modifiers may be sex linked, but others, including the main gene, are autosomal. Chemical analyses did not reveal changes in the composition of the bones of newly hatched chicks, but abnormalities in calcium and phosphorus metabolism are noted. Modifiers of rumplessness serve as stabilizers of normal development of the caudal skeleton.

Heritable intraembryonic hypertrophy of chicken testes, R. G. JAAP. (Okla. Expt. Sta.). (*Genetics*, 30 (1945), No. 1, p. 11).—Natal testis weight of individual birds was shown to vary from 2 to 22.7 mg. The averages for the testis weight of ♂ progeny from individual dams varied from 4.6 to 10.5 mg. The natal testis weights differed significantly between the average for the progeny of different strains, of sires, and of dams within sires. There were no influences from chick size or season. Crosses between strains producing chicks with large and small testis weights produced weights larger than the average of the two parents. The results from reciprocal crosses suggest that at least one gene for intraembryonic hypertrophy of the testes may be sex-linked, and there is a suggestion that further

testing is necessary regarding the question of the same gene being responsible for early sexual maturity in ♀♀. Testis weight at hatching was proven to be an indicator of potential body weight in the early postnatal period. Evidently gonadotropic hormones are being elaborated by the chick prior to hatching. Probably variations in testis hypertrophy may be attributable to either differences in gonadotropic stimulation or responsiveness of the testis tissue.

**Further division of contrasting antigens in species hybrids in ducks, W. II.** McGIBBON. (Wis. Expt. Sta.) (*Genetics*, 30 (1945), No. 3, pp. 252-265).—Further study of what first appeared to be a pair of contrasting cellular characters specific to Muscovy and not shared with mallard ducks (E. S. R., 92, p. 501) has shown that one had at least five parts and the other at least three or probably four parts. Different combinations of these parts of the two characters were encountered in the species hybrids and also in Muscovy. Either of two genetic explanations seems a logical interpretation—one involves linked genes and a single pair of Muscovy chromosomes controlling each of the two parts of the characters with certain ones probably allelic; the other proposes that a series of alleles at a single locus on a Muscovy chromosome control the expression of each of the components of the two complexes. The tests were based on a series of cells from 71 hybrids of reciprocal crosses of Muscovies and mallards and a number of individuals from these parental species.

**Suggestive evidence for duplicate genes in a species hybrid in doves, M. R. IRWIN and R. W. CUMLEY** (*Genetics*, 30 (1945), No. 3, pp. 300-301).—"The 'hybrid substance' of the species hybrids between Pearneck and ringdove has been divided into three components by virtue of results obtained by agglutinin absorption with the cells of various backcross hybrids. One of these fractions has been found always associated with the *d*-4 antigenic character of Pearneck, another with the *d*-11. A third fraction detectable to date only with reagents prepared from a strongly reacting hybrid antiserum seemed to be linked, but not completely, with each of several antigens of Pearneck. This fraction appeared to be but one substance, or a group of very closely related substances, irrespective of association with different antigens of Pearneck, these later presumably being genetically as well as immunologically independent. These results suggest that genes with duplicate effects in interaction are located on several chromosomes of Pearneck. There is still another possible, but perhaps less probable, explanation of the association of the third fraction of the hybrid substance with several of the unit antigens of Pearneck. In this explanation, it would be assumed that this fraction was produced by a gene or genes on but one chromosome of Pearneck interacting in the species hybrid with one or more genes from ringdove, and the seeming association with various antigens specific to Pearneck was then entirely one of chance."

**The relative thyroidal potency of *l*- and *d,l*-thyroxine, E. P. REINEKE and C. W. TURNER.** (Mo. Expt. Sta.). (*Endocrinology*, 36 (1945), No. 3, pp. 200-206, illus. 3).—Continuing the study of the effect of thyroxine on metabolism and thyroid weight of thiourical-treated rats (E. S. R., 93, p. 271), it was found that *l*-thyroxine produced twice the effect of racemic mixtures. From these results with rats, chicks, and tadpoles, it was concluded that the activity of a rasemic thyroxine can be accounted for by its *l*- component and that the *d*- compound has little or no activity.

## FIELD CROPS

**Plant geography and culture history in the American Southwest, G. F. CARTER** (New York: Viking Fund, 1945, pp. 140, illus. 27).—Crop plants are used as a key to cultural history in attempts to solve some of the problems of cultural origins in North America and particularly in the American Southwest. The approach in the study is from the geographers' point of view, and emphasis is

placed in areal distributions. Special consideration is given to distributions of corn, tepary and kidney beans, lima beans, and cotton, and to the distribution of the domesticated cucurbits and the implied cultural derivations. Comment is made on the influence of climatic limitations on crop distributions and also on the distribution of irrigation in the Southwest. The areal differentiation within the Southwest on the basis of crop assemblages is considered in conclusion. The bibliography comprises nearly 150 references.

**Irrigation of arable crops on a rice soil**, R. P. BARTHolemew, L. C. KAPP, and M. NELSON (*Arkansas Sta. Bul.* 455 (1945), pp. 32, illus. 3).—Cotton, corn, and soybeans and Kohi lespedeza for hay and seed responded in increased yields to irrigation on Crowley silt loam in experiments 1931–43 at the Rice Substation. The increases were associated with the need of the plant for water, that is, the number of irrigations necessary. Cotton and corn also made substantial increases in response to fertilizer, particularly in combination with irrigation.

**Crop and pasture lands in the postwar period** (*Idaho Sta. Cir.* 98 (1945), pp. 7).—Problems relating to use of cultivated crop and pasture lands of Idaho, discussed briefly, include irrigation, drainage, and land clearing; crop varieties and pure seed; weed control on crop land; control of plant disease, insects, and rodents; commercial fertilizers; soil surveys and soil conservation surveys; and conservation needs.

**Improved pastures from better grasses and legumes**, H. R. COX and G. H. AHLGREN (*New Jersey Sta. Cir.* 492 (1945), pp. 11, illus. 4).—Adapted pasture grasses and legumes, proper seed mixtures for different soil types, productive seeding methods and fertility practices, and ways to manage multiple-purpose herbage are discussed with the aim of an all-season pasture plan.

**Extent and longevity of the seminal roots of certain grasses**, J. E. WEAVER and E. ZINK. (Univ. Nebr.). (*Plant Physiol.*, 20 (1945), No. 3, pp. 359–379, illus. 7).—In all 14 species of perennial grasses studied at 4 growth stages, the seminal root extended 6 to 10 in. in depth during the first 21 days after planting and 7.5 to 27 in. after 41 days. It continued vigorous growth at least until some nodal roots had reached depths of 16 to 24 in. Depth had increased but little at 59 to 74 days, but practically all of the seminal roots were functioning at a time when the abundant tillers were one-half to two-thirds or even fully as tall as the parent culm. At 90 to 123 days, when the grasses were 9 to 19 in. tall and those of two species had blossomed, the seminal roots, despite 6 to 60 nodal roots, extended deeply and frequently to 24 in. deep. Maximum penetration of seminal roots of 24 to 36 in. was ascertained in certain species. One to 4 nodal roots developed on the parent culm of nearly all of the grasses before tillers appeared. Plants with seminal roots alone not only developed normal, leafy parent culms 8.5 to 14 in. tall but also produced several to many tillers. Seminal roots of the smaller cereals are not temporary. Those of 14 perennial grasses were usually deep and spread widely, and remained alive and active as absorbing organs 3.5 to 4 months.

**The effects of season and frequency of cutting on the productivity of various grasses under coastal conditions in northern Queensland**, J. L. SCHOFIELD (*Queensland Jour. Agr. Sci.*, 1 (1944), No. 4, pp. 1–58, illus. 17).—The perennial grasses *Brachiaria decumbens*, *B. purpurascens* (Para), *Cenchrus ciliaris* (buffel), *Chloris gayana* (Rhodes), *Cynodon plectostachyum* (African star), *Digitaria milanjiana* (woolly finger) *Hyparrhenia aucta*, *Melinis minutiflora* (molasses), *Panicum maximum* (Hawaiian strain of guinea), *P. maximum coloratum* (purple-topped guinea), *P. maximum trichoglume* (slender guinea), *Paspalum dilatatum* (paspalum), *Pennisetum clandestinum* (kikuyu), and *Urochloa bolbodes* were subjected to monthly, two-monthly, and three-monthly cutting treatments over a period of 1 or 2 yr. at the Bureau of Tropical Agriculture, South Johnstone, in the "wet belt" of coastal northern Queensland. The grasses with two exceptions exhibited

a phase of high productivity just after the period of establishment, and thereafter each 12 mo. could be divided into the productivity periods of rapid increase, zenith, rapid decrease, and low. Rainfall, temperature, and length of day appeared to be the main environmental factors controlling the pattern of productivity. A marked falling-off in yield occurred during the second 12 mo. from April to October 31, but yield rapidly increased from November onwards as a result of fertilizer applications becoming effective. *Panicum maximum typica* and *D. milanjiana* responded markedly to fertilizers. In general the longer cutting rotation resulted in higher yields of green matter than the monthly cutting; and the dry-matter content of grasses was highest in the 3 mo. cutting. There was a negative correlation of dry matter with yield over much of the year. Variations in yields of green matter and dry matter are treated in detail. In discussion of the exceptional behavior of *M. minutiflora* and *H. aucta*, it is shown that the latter has a functional periodicity different from that of the other grasses studied. The high dry-matter content of *C. plectostachyum* under each rotation and in each productivity period is commented upon. A wide range of variation in inflorescence emergence was evident, and in certain grasses the intensity and duration of inflorescence production was associated with high yield.

The effect of defoliation, soil fertility, temperature, and length of day on the growth of some perennial grasses, R. L. LOVVERN. (N. C. Expt. Sta. and U. S. D. A.) (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 7, pp. 570-582, illus. 4).—Dallis grass, carpet grass, Bermuda grass (E. S. R., 92, p. 361), and Kentucky bluegrass were grown pure under greenhouse conditions of 10- and 15-hr. day lengths at 80°-90° and 60°-70° F., and at a high and a low soil fertility level, and were cut every 10, 20, and 30 days during the winter of 1941-42. In the winter of 1942-43, the long days were omitted and in an additional treatment the plants grew 60 days before cutting.

Cutting treatments and soil fertility affected the yield of top growth more than did the other factors. Most species would require more careful management at higher than at lower levels of fertility for maximum production. Dallis grass was affected more than the other grasses by frequent cutting and therefore requires more careful management for highest yield. Carpet grass was affected least. Yields of top growth at 80°-90° were in the descending order Dallis grass, Bermuda grass, carpet grass, and Kentucky bluegrass, and at 60°-70° Dallis grass, Bermuda grass, Kentucky bluegrass, and carpet grass. Top growth was greater under the short day at 80°-90° than at 60°-70°. Frequent cuttings were more effective in reducing yields of root growth than of top growth, which was increased relatively more by fertilization. Yields of root growth at 80°-90° were in the descending order of Dallis grass, carpet grass, Bermuda grass, and Kentucky bluegrass. Yields of carpet grass roots were not influenced by the fertilizer. Yields of root growth at 60°-70° fell into a high group, Dallis grass and Kentucky bluegrass, and a low group, carpet grass and Bermuda grass. Yields were generally reduced more by frequent cutting at 80°-90° and higher soil fertility than at 60°-70° and lower fertility. All first-order interactions between species, fertility levels, and cutting treatments were significant.

Composition and yield of Kentucky bluegrass and Korean lespedeza at different stages of growth, G. D. BUCKNER and A. H. HENRY (*Kentucky Sta. Bul.* 473 (1945), pp. 12, illus. 1).—Bluegrass growing continuously on Maury silt loam at Lexington averaged more dry weight per acre (0.477 ton) than grass clipped repeatedly (0.372 ton). Continuous grass made little increase from July to September. The percentage of protein in bluegrass repeatedly clipped was considerably higher than in continuous grass, of fat appreciably higher, and of fiber and of N-free extract materially lower. Fall growth was more proteinaceous than that of spring and summer. Total production of water-free grass on the repeatedly clipped plot

was less than production from cumulative growth in five periods. However, more protein was produced under frequent clipping in 15 out of 17 2-week periods, than was produced under cumulative growth, in the same time. An inference from these findings is that livestock grazing young bluegrass or bluegrass frequently clipped, which prevents the fruiting stage, consume a more proteinaceous feed and get more protein per acre than if they had eaten the grass after it had matured. It would seem that grass continues to make protein in preparation for the fruiting stage which is not permitted to arrive.

The percentage of protein in Korean lespedeza clipped repeatedly was higher than in that grown continuously, but not to the extent in bluegrass. The percentage of fat in the lespedeza was about the same under both systems, while the fiber in the cumulative growth was much higher than where herbage was clipped repeatedly. Water-free yield averaged nearly three times as much from cumulative growth as from frequent clipping in the same time.

**Growing hay crops and making quality hay**, G. H. SERVISS and H. B. HARTWIG (*N. Y. State Col. Agr., Cornell Ext. Bul. 568, rev. (1945)*, pp. 8, illus. 2).—Seeding mixtures are recommended, cultural and fertility practices are described, management is indicated for Ladino clover, and hay making procedure is outlined, all with the aim of producing hay of the highest feeding value consistent with satisfactory yields and economy of production.

**Turf management in Rhode Island**, R. S. BELL (*Rhode Island Sta. Misc. Pub. 26 (1945)*, pp. 1-12).—Practical suggestions are made on establishing and managing lawns and other turf (E. S. R., 83, p. 333). Suggestions on the control of turf and lawn diseases and of insects are noted on pages 725 and 742.

**New lawn grasses**, H. SEVERSON (*Seed World, 57 (1945), No. 11, pp. 8-10, illus. 2*).—Lawn plants popular or promising in the southern States include Coastal Bermuda and Lawn Bermuda No. 12, brought forward by G. W. Burton (U. S. D. A. coop. Ga. and Ga. Coastal Plain Stas.), *Zoysia matrella*, centipede grass (*Eremochloa ophiuroides*), carpet grass (*Axonopus affinis*), and St. Augustine grass (*Stenotaphrum secundatum*). The merits of several new strains of Bahia grass (*Paspalum notatum*) are also discussed.

**A method for estimating carrying capacity of range lands**, W. DASMANN. (U. S. D. A.). (*Jour. Forestry, 43 (1945), No. 6, pp. 400-402*).—Questioning the reliability of estimates of carrying capacity based on methods now used in range surveys, the author suggests a new method based on the estimated weight of each species, a proper-use (or allowable-cropping) factor, and a preference rating which indicates the amount of each species that will be consumed when the key species receives no more than allowable cropping.

**Growing alfalfa in New Jersey**, G. H. AHLGREN, H. B. SPRAGUE, and F. E. BEAR (*New Jersey Sta. Bul. 718 (1945)*, pp. 40, illus. 15).—Information on the soil, and fertility needs, varieties, cultural and harvesting requirements and insect and disease control, considered essential in producing satisfactory crops of alfalfa is based extensively on research with the crop.

Since alfalfa thrives at pH 6 or higher, application of from 1 to 5 tons of limestone per acre is indicated on most New Jersey soils before seeding. The crop has responded to heavy application of P and K and early growth is stimulated by a small amount of N at seeding. B deficiency, common in some areas, may be corrected by 10 lb. of borax per acre on light soils and 20 lb. on heavy soils. While the hardy variegated and common alfalfas from the northwest are adapted throughout the State, Kansas common is suited only to central and southern New Jersey. Atlantic, Buffalo, and Ranger have surpassed other varieties tested and may enable the prolonging of the period of productive stands. Timothy, bromegrass, and orchard grass may be grown profitably with alfalfa. Seeding inoculated seed in

August, March, or April on a firm seed bed—a cultipacker seeder being particularly effective—is advised. A variety of grain companion crop resistant to lodging minimizes that threat to alfalfa seedlings, and competition may be reduced by using the companion crop for pasture, hay, or silage. Unless the field is very weedy, clipping in the seeding year is inadvisable. The first crop of alfalfa is to be cut when in one-tenth bloom; the second, when in full bloom; and the third, before September 1 in central New Jersey and September 10 in southern New Jersey. If alfalfa is cut during the critical fall period there is danger of losing the stand by winterkilling. As good green hay is an important source of pro-vitamin A, preservation of the color is very desirable. High acre yields through the use of adequate lime, manure, fertilizer, and adapted seed have reduced cost of production per ton of hay.

**Influence of phosphorus deficiency of the soil on the protein content of alfalfa,** F. J. ALWAY and G. H. NESOM. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 7, pp. 555-569).—N was determined on 61 pairs of samples of alfalfa from 52 fields, all markedly P-deficient. Superphosphate or calcium metaphosphate had been applied on part of each field and all showed increased yields, averaging 80 percent on 51 fields measured. The P content increased on 49 of 50 fields determined, with an average increase of 34 percent. The N content of alfalfa from P treatment was more than 0.10 percent higher in 37 fields, more than 0.10 percent lower in 5, and the difference was less than 0.10 percent in 19 others. The average increase was 0.16 percent N, or 1.00 percent crude protein. In farm practice P fertilizers on markedly P-deficient soils may be expected to usually cause an appreciable increase in the protein content of alfalfa hay.

**Ash content of barley plant parts when grown on two different soils,** M. N. POPE. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 7, pp. 582-583).—Awns of Wisconsin Winter and Esaw barleys have consistently been tough and adherent at Arlington, Va., on Keyport loam (pH 5.0), while those of these varieties grown on alluvial "flats" (pH 6.5) were deciduous or nearly so. The varieties differed rather widely in ash content, yet both showed extraordinarily high concentrations when grown on the alluvial soil as compared with the upland soil, especially the leaves and awns. Esaw barley awns contained 30.63 percent ash when grown on the flats and 10.01 percent on upland, and Wisconsin Winter awns 35.52 and 9.12 percent, respectively.

**Ash content of barley awns and kernels as influenced by location, season, and variety,** E. ÅBERG, G. A. WIEBE, and A. D. DICKSON. (Univ. Wis. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 7, pp. 583-586).—The ash content in awns and kernels was determined for two winter and four spring barleys. Ash content of the awn was high, sometimes as much as one-third of its dry weight, but influenced considerably by location, season, soil, and variety. Differences of 25 percent in ash content of awns were found in the same variety grown at different locations. Ash content of awns may also influence the percentage of the deciduous awns.

Variations occurred in the ash content of the kernels similar to those in the awns. Total ash content of the kernels was much lower, however, and variations between locations were much smaller than with awns.

**Dry-bean production in New York,** E. V. HARDENBURG (*N. Y. State Col. Agr., Cornell Ext. Bul.* 669 (1945), pp. 7, illus. 2).—Productive culture methods are outlined, and suitable varieties are recommended. Ways to control bean maggot, Mexican bean beetle, and bean weevil are suggested by R. W. Leiby.

**Bromegrass in Iowa,** C. P. WILSIE, M. L. PETERSON, and H. D. HUGHES (*Iowa Sta. Bul.* P75 (1945), pp. 497-528, illus. 11).—The characteristics of bromegrass (*Bromus inermis*); its adaptation; varieties and strains; uses in rotation pastures,

for hay and seed, for grassing waterways and waste places, in mixtures, and as bromegrass-alfalfa silage; and production and management practices are described extensively from station tests and experience.

Bromegrass, grown in association with alfalfa or other legumes, is valuable for pasture and hay in Iowa and also ranks high in erosion control, particularly for grassed waterways and terrace outlet channels. Varieties of the "southern type," e. g., Fischer (Iowa), Lincoln (Nebr.), and Achenbach (Kans.), have surpassed in Iowa regional strains and varieties originating in more northern States and in Canada. Seed yields have ranged from 200 to 700 lb. per acre. Harvesting with a combine has been satisfactory and efficient, and clipping only the seed heads above the leaves, leaves much forage for pasture or hay. Successful stands are obtained from seeding in early spring or late summer. For pasture, 10 to 12 lb. of bromegrass and 4 to 6 lb. of alfalfa will give excellent results; for hay, greater yields may be expected by increasing the proportion of alfalfa to bromegrass. Red clover and sweetclover, alone or in combination, may replace alfalfa in pasture seedings. In establishing bromegrass stands the use of lime and phosphate is important to promote a vigorous growth of the accompanying legume which aids in maintaining the N supply. Unproductive stands are stimulated greatly by N fertilizers or barnyard manure, and yields also may be improved by reseeding a legume in the grass, after thorough disking in early spring to subdue the sod. Grazing should be managed to maintain a growth of 6 to 8 in. in the pasture.

**Cotton variety tests in the Yazoo-Mississippi Delta,** J. W. NEELY and S. G. BRAIN (*Mississippi Sta. Bul.* 416 (1945), pp. 11)—Varietal comparisons in seven localities showed Stoneville 2B, Deltapine 14, and Bobshaw 1 to lead in money value; Wilds 16 (1½ in.) and Bobdel, Delfos 444, 531C, and 651, and Stoneville 2C (1¾ to 1½ in.) to have longest staples; and Bobdel, Delfos 531C, 444, and 651, and Miller to be earliest. Wilds 16, Bobdel, and Bobshaw 1 were outstanding in fiber bundle strength; and Rowden (Roldo), Miller, Deltapine 14, Bobshaw 1, and Bobdel were superior in fiber length uniformity.

**Some observations on leaf shape expression in the Malvaceae,** S. G. STEPHENS (*Amer. Nat.*, 79 (1945), No. 783, pp. 380-384).

**The 1944 "Arkansas traveler,"** H. R. ROSEN. (Ark. Expt. Sta.). (*South. Seedsman*, 7 (1944), No. 9, pp. 11, 54, illus. 3).—Traveler (E. S. R., 92, p. 871) a new hardy winter oats developed from Victoria  $\times$  Curtis and tested extensively in cooperation with the U. S. Department of Agriculture, has been outstanding in grain production and for winter pasture, and possesses resistance to crown rust, smut, and lodging.

**Two new strains of Virginia type peanuts,** E. T. BATTEN (*Virginia Sta. Bul.* 370 (1945), pp. 4, illus. 1).—Holland Jumbo and Holland Virginia Runner, new strains of Virginia-type peanuts (E. S. R., 84, p. 39), are adapted to different requirements of the trade and meet varying conditions found on the farms of producers. Holland Virginia Runner, which has short and thick kernels, supplies the need for a strain with exceptionally high meat content without special regard to size of pods and kernels, chiefly for use in making peanut butter and also valuable oil. This peanut is more suitable for growing on the darker, heavier soils not adapted for varieties with large bright colored pods. Holland Jumbo provides a peanut with a high percentage of extra large kernels, chiefly for high-grade salted nuts and for general confectionery purposes, and with a high content of large, bright colored pods to be hand-picked and sold as unhulled goods. It is best adapted to production on the light colored, sandy soils with a relatively high Ca content.

**Effect of growth promoting chemicals when used in potato seed treatments,** E. K. ALBAN. (Ohio State Univ.). (*Ohio Veg. and Potato Growers Assoc. Proc.*, 30 (1945), pp. 162-174).—Chippewa and Katahdin potatoes under field and green-

house conditions at Columbus, 1943-44, showed an increased yield following treatment with growth-promoting substances as compared with untreated seed. In 16 of 19 cases, total yields after chemical treatments of cut seed exceeded total yields of check plats. Where relatively low concentrations of dusts were used and in various combinations of growth substances, increased yields over check plats varied from 10 to 29 percent. Use of high concentrations of indolebutyric acid in dusts for seed treatment should be avoided with Chippewa. Recommendation of commercial application is deferred pending further study.

**Potato growing in New York,** E. V. HARDENBURG (*N. Y. State Col. Agr., Cornell Ext. Bul. 667* (1945), pp. 8, illus. 2).—Specific recommendations are made on potato soils and their conservation, rotations, varieties, seed and treatment, fertilizers, planting, spraying and dusting (by M. F. Barrus and W. A. Rawlins), and on harvesting and storage.

**The rubber content of some South Dakota plants,** A. L. MOXON and E. I. WHITEHEAD. (*S. Dak. Expt. Sta.*) (*S. Dak. Acad. Sci. Proc.*, 23 (1943), pp. 53-55).—Rubber contents of dry material were for yellow goatsbeard, leaves and roots, 0.37 percent; leafy spurge leaves 0.42 to 0.45, roots 0.11; prairie pink, roots, 0.23; Osage-orange, fruit, 0.42; snow-on-the-mountain, leaves and stems, 0.13 to 0.15; prickly lettuce, leaves and stems, 0.11 to 0.32; common dandelion leaves 0.48, roots 0.30; and Russian dandelion leaves, 0.67 to 0.74, roots 0.75 to 0.97 percent. The two dandelions were the only plants to yield a rubber of good quality, that from the other plants being too waxy to be of much value.

**Idaho Amber sorgo,** K. H. KLAGES (*Idaho Sta. Cir. 97* (1944), pp. 8).—Idaho Amber sorgo, a selection from Early Amber, is characterized by high yields of quality forage and rather compact heads, uniformity, and sturdy leafy stems resistant to lodging, and is early enough for any of the areas in Idaho adapted to sorghum production. Practical suggestions on growing sorghums cover soils, culture and irrigation practices, harvest methods, diseases, and HCN poisoning.

**Effect of manure, moisture, and mechanical injury on the hydrocyanic acid content of sorghum,** C. J. FRANZKE and A. N. HUME. (*S. Dak. Expt. Sta.*) (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 7, pp. 523-531; illus. 4).—Several strains of sorghum were grown in pots on 2 soil types with and without 10 tons of manure and at 15, 25, and 35 percent of moisture. Factors favoring normal growth, such as soil type, application of manure, adequate moisture, and freedom from mechanical injury, resulted in a lower HCN content in sorghum plants (E. S. R., 81, p. 780). Injured or stunted plants where growth had been retarded maintained a high HCN level for a longer period than plants where growth was rapid and normal.

**Influence of spacing on yield and other characters in soybeans,** A. H. PROBST. (*U. S. D. A. and Ind. Expt. Sta.*) (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 7, pp. 549-554).—Dunfield, Illini, Mandell, and Mukden soybeans differed somewhat in yield response when plants were spaced 1, 2, 3, 4, and 5 in. apart in 30-in. rows, 1938-41. The varieties X spacings interaction, however, was significant in only 1 yr. The least difference in yield and usually the highest yield were obtained when plants were spaced 2 or 3 in. apart. Variations in stand with plants from 1 to 3 in. apart in the row and occasional gaps of 4 or 5 in. between plants of an otherwise thicker stand evidently should not prevent superior varieties from expressing themselves as to yield in varietal trials. Thick planting has been conducive to lodging and delayed maturity. Spacing had little effect on plant height or seed size.

**Annual report of the Tobacco Institute of Puerto Rico,** C. ESTEVA, JR. (*Tobacco Inst. Puerto Rico Ann. Rpt.*, 1942, 1943, pp. 65).—Progress results are reported from the research projects and other activities of the institute (E. S. R., 89, p. 64).

**Comparative yields and quality data for five hard red spring wheat varieties as affected by growth location**, R. H. HARRIS, L. R. WALDRON and L. D. SIBBITT. (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 5, pp. 8-11).—Tests on Newhatch, Thatcher, Mida, Rival, and Pilot wheats grown in 18 localities in North Dakota in 1944 indicated that variety and location of growth both influenced significantly the yield per acre and wheat quality. Environment during seasonal growth appeared to have more effect than heredity, as denoted by wheat variety, in respect to protein content of wheat, while the contrary seemed true for flour yield. Little difference was evident between the comparative effects of location and variety upon test weight and loaf volume. See also a note on a study on wheats grown in 1943 (E. S. R., 93, p. 149).

**The production of quality in Missouri soft wheat**, J. M. POEHLMAN and F. BOWMAN (*Missouri Sta. Bul.* 487 (1945), pp. 15, illus. 8).—Wheat quality is discussed from the viewpoint of farmers and millers. Comments are made on the inadequacy of current wheat grading standards and on developments in wheat marketing. Wheat changes in Missouri 1919-44 in relation to quality and the reasons for such changes are explained. Early Premium and Clarkan, currently recommended in Missouri on the basis of tested milling and baking qualities, are compared with Kawvale.

**Sodium bicarbonate does not reduce the moisture content of high moisture wheat** (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 5, p. 24).—Lots of wheat containing 18.7 and 14.9 percent of moisture respectively were stored by R. H. Harris for 7 days at room temperature and treated with sodium bicarbonate 0.02 percent (about 10-15 lb. per 1,200 bu. of wheat), 0.04, 0.08, 0.26, and 2.0 percent. In the 7 days there was no substantial difference in the moisture content of the untreated and the treated wheat. At the highest percentages of sodium bicarbonate, the wheat had an undesirable appearance resembling "limed wheats" and an unpleasant odor.

**Inspection of agricultural seeds**, F. W. QUACKENBUSH ET AL. (Coop. U. S. D. A.). (*Indiana Sta. Cir.* 301 (1944), pp. 160, illus. 1).—The purity, germination, and weed seed contents, and for legumes the hard seed contents, are again (E. S. R., 91, p. 155) tabulated from tests of 1,794 of the 1,985 official seed samples collected during the year ended June 30, 1944.

**The development of viable seed in yellow star thistle plants under various conditions**, R. M. DRAKE (*Calif. Dept. Agr. Bul.*, 34 (1945), No. 2, pp. 89-91).—Seed from different stages of flower head development on yellow star-thistle plants growing, cut and dried, or sprayed with oil (75 percent gas oil and 25 percent 200-penetration asphalt) at several stages were tested for germination. It was apparent that the seed coat is remarkably resistant to oil and that this resistance greatly increases with age, particularly for the dark, short pappus-free type of seed. An appreciable percentage of seeds is not destroyed by oiling under average field conditions when applications are made during or after full bloom.

**On the fable of Joe Pye, Indian herbalist, and Joe Pye weed**, F. G. SPECK and E. S. DODGE (*Sci. Mo.*, 61 (1945), No. 6, pp. 63-66).—The review covers a number of references to *Eupatorium purpureum*.

**Chemical weed killers**, R. A. STETSON (*Soap and Sanit. Chem.*, 21 (1945), No. 7, pp. 104-107, 119-121, illus. 1).—A practical discussion of the merits of chemical herbicides in current use and ways to apply them.

**Relation of temperature to the selective herbicidal effects of 2,4-dichlorophenoxyacetic acid**, P. C. MARTH and F. F. DAVIS. (U. S. D. A.). (*Bot. Gaz.*, 106 (1945), No. 4, pp. 463-472, illus. 4).—Early winter cress and narrow-leaved plantain, established in 4-in. clay pots at 65°-75° F. were moved to greenhouses in which temperatures of 32°-40°, 50°-65°, 65°-75°, and 75°-90° were maintained,

and separate lots each were spray-treated with 0, 500, 1,000, and 1,500 p. p. m. concentrations of 2,4-dichlorophenoxyacetic acid (E. S. R., 93, p. 285) 1 week later. Carbowax 1500 was included in the acid sprays. Treatment at 65°-75° and 75°-90° resulted in rapid killing (18-21 days). All three concentrations of the acid were about equal in effectiveness, although at 50°-60° to kill plants with the acid treatment took 11-15 days longer, while at 32°-40° treated plants were alive 50 days after spray applications. The acid was present in lethal amounts, either within the tissues or on the surface, of plants treated in the greenhouse and held at 32°-40°. Spray treatments with 1,000 p. p. m. concentration of the sodium salt of the acid were about equal to the acid in effectiveness in causing death of early wintercress, mustard, bindweed, narrow- and broad-leaved plantain, and hedge-mustard. The salt likewise was present in or on plants treated at 50°-60° for they soon died when removed to a warmer temperature. The ammonium and the sodium salts of the acid were effective in killing lawn pennywort, heal-all, and common chickweed. Death of plants of the first two was hastened by removal from a greenhouse at 60° to one at 75°-80°. Field experiments demonstrated that dormant narrow-leaved plantain in frozen ground, having some living leaves, when treated with the acid or its sodium salt sprayed 1,000 p. p. m. at 5 gal. per 1,000 sq. ft. is killed when plants are placed under temperature conditions favoring growth.

**Use of sodium cyanide for the eradication of undesirable plants, M. M. McCool** (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 10, pp. 473-477).—Dandelion and plantain (*Plantago major*) were eradicated by sodium cyanide, whether applied in the solid form to the crowns, in solution sprinkled on the leaves, or poured on the soil around the plants or into adjacent holes. One application killed crabgrass and foxtail grass. Three applications of solutions containing 3 percent or more of the salt each at the rate of 1 l. per square meter were required to prevent the reappearance of quackgrass plants from July until the growing season ended. Quackgrass was killed by one application of ammonium sulfamate in solution containing 3 percent or more. European and hedge bindweeds were killed either by drenching the above-ground portions with 4 percent or stronger solutions of sodium cyanide or by pouring solutions into holes adjacent to the plants. Honeysuckle vines were killed by the use of 1 l. of 3-percent solution per square meter. Poison-ivy growing along the roadside was eradicated by sprinkling 2-percent or stronger solutions of sodium cyanide and by applying 3-percent or greater solutions to the roots where the vines had climbed trees and fence posts.

## HORTICULTURE

**Soil nitrates under various fertilization and green-manure cropping systems, W. H. UPSHALL, O. A. BRADT, and J. R. VANHAARLEM** (*Sci. Agr.*, 25 (1944), No. 4, pp. 179-184, illus. 3).—In 1936, there was established at Vineland, Ontario, a comprehensive experiment on the maintenance of soil organic matter, with a special view to determining the best cover crop for orchards. Judged on the basis of dry matter of buckwheat as a green-manure crop and nitrate accumulation under the buckwheat, either legume hay or straw or combinations of the two were satisfactory substitutes for farm manure. A combination of farm manure and straw was somewhat less satisfactory, and where straw was used by itself, even with adequate nitrogen the growth of buckwheat was depressed.

Under buckwheat there was an almost continuous reserve of nitrate, whereas under millet and weeds of the grass family, starting in mid-May, the nitrates were soon reduced to negligible amounts. Buckwheat is considered a safer green-manure cover crop to use where cultivation is to be discontinued about the middle of May. For a green-manure crop to sow in July, when the flush of tree growth is over,

millet or weeds would probably be satisfactory, especially on fertile soils where fruit coloration and winter injury are problems.

The effects of the minor elements, boron and manganese, upon the quality of vegetables, with especial reference to the tomato (*Lycopersicon esculentum*), O. B. GUM (*Ohio State Univ., Abs. Doctoral Diss., No. 45 (1944)*, pp. 113-121).—Tomato and beet plants, grown in cultural solutions in large concrete tanks, were subjected to deficiencies of boron and manganese. The tomatoes demonstrated both manganese and boron deficiencies and the beets, boron deficiency. The symptoms are described. A lack of adequate boron affected the quantity of sugars and nitrogen in beets and tomatoes. Manganese deficiency had no apparent specific effect on any factor that could be associated with quality.

Inconsistent results were obtained in analyses for vitamins. The amount of carotene was decreased appreciably in both the tomato and beet from deficiencies of either boron or manganese. Apparently a certain threshold is necessary to prevent external symptoms below which the general metabolism is undoubtedly disturbed. Once this threshold is reached, there did not appear to be much correlation between the amount of boron or manganese available and the vitamin content.

The distribution of weight change in the young tomato plant.—I, Dry-weight changes of the various organs, D. W. GOODALL (*Annu. Bot. [London], 9 (1945), No. 34, pp. 101-139, illus. 5*).—The dry-weight changes in the various portions of the tomato plant were followed through a 24-hr. period at various times during a year. The hourly rate of increase in dry weight of the whole plant during the day does not vary greatly in summer and winter; the much greater difference in relative growth rate can be ascribed largely to the difference in length of day. The rate of increase in dry weight of the whole plant was higher in the morning than in the afternoon, due probably to difference in light intensity. During the evening the plants lost in dry weight much more rapidly in summer than in winter although the average temperatures differed very slightly. The additional amount of assimilate produced in summer over that produced in winter goes mainly to the stem, the root, and the largest leaves. In proportion to the increase of the whole plant the gain in dry weight of the young leaves is much greater in winter than in summer.

. Inducing dormancy in lettuce seed with coumarin, G. E. NUTILE (*Plant Physiol., 20 (1945), No. 3, pp. 433-442, illus. 3*).—Nondormant seeds of the Black Seeded Simpson lettuce were made dormant or light sensitive by soaking the seeds in a 25 p. p. m. coumarin solution for 24 hr. at 18°-20° C. Coumarin is photosensitive after entering the seed, and will not exhibit any inhibitive effects on germination if the seeds are soaked in the light or if light strikes the seed while wet. Dormancy could be induced in approximately 80 percent of the seeds, as was shown by the dark test.

Coumarin-treated seed responded in germination to various conditions in a manner similar to naturally dormant lettuce seed; inhibitive effects of coumarin were overcome by light during the germination test, responded to prechilling and to treatment with thiourea.

Experiments showed that the processes of making dormant seed nondormant by exposure to light and high humidity and of inducing dormancy in nondormant seeds with coumarin are to a large degree reversible.

Expression of certain hereditary factors in Yellow Bermuda onions induced by unseasonable planting in the greenhouse, S. S. IVANOFF. (*Tex. Expt. Sta., (Bot. Gaz., 106 (1945), No. 4, pp. 411-420, illus. 2*)

Unusual variations were observed in a population of Yellow Bermuda onions grown from seed sown in June in a greenhouse where the plants were subjected to unusually high temperatures and light intensities. The lot of onions produced within a year (1) onion sets, (2) single bulbs of various sizes, (3) multiple bulbs maturing without seed stalks,

and (4) multiple bulbs producing seed stalks and viable seed. From 10 to 40 percent of all unseasonably grown plants completed their life cycle in less than a year, forming multiple bulbs and stems with viable seed. The seasonably grown plants in the field produced, on the other hand, mostly single bulbs and a few doubles, splits, and bolters.

**Register of new fruit and nut varieties:** List No. 1, R. M. BROOKS and H. P. OLMO. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 467-490).—This present list, the first published since the inception of the register in 1942, contains information on the origin and important fruit characteristics of varieties of fruits and nuts introduced during and since 1920. Wherever possible the information was obtained from the originator himself, and many horticulturists throughout the nation and Canada were consulted in order to attain the maximum accuracy. The species, and the varieties within a species, are arranged alphabetically to facilitate the ready use of the register.

**Framework fruit trees,** J. J. Woods and E. R. HALL (*Sci. Agr.*, 25 (1944), No. 4, pp. 163-168, illus. 3).—Framework was found to be a highly satisfactory method of converting pear trees from one variety to another. Boussock pears, grafted in the spring of 1942 by the framework method to Bartlett, yielded a nice crop of fruits in 1943 and again in 1944. No instance of stock-scion incompatibility was observed in using Bartlett on four different stocks, Bachelier on one stock, and Amanlis on another stock. It is necessary to work with trees in a healthy vigorous condition. Little success attended efforts to framework apples and plums.

**The effects of wire girdles on apple trees in the nursery,** F. C. BRADFORD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 173-176).—Observation on a large number of apple varieties, including many foreign introductions, showed that the wire girdle placed around the base of the trunk of root-grafted trees with a view to inducing root-formation by the scion may have a notable effect in reducing the growth of the tops. This depressing effect was not highly evident the first growing season, but in the second year the differences between wired and unwired trees were highly significant. In these experiments the mean linear top growth of the normal trees amounted to 162 percent of that of the wired. No evidence was found that top growth in the second year, when the scion roots are present, was significantly greater on trees with scion roots than on those without scion roots, either in the wired or in the normal trees. Varieties differed apparently in the readiness with which they overgrew the girdles. It is deemed possible that the restriction in top growth by girdling might delay the onset of profitable production.

**Morphological changes in peach seedlings following after-ripening treatments of the seeds,** H. B. TUKEY and R. F. CARLSON. (N. Y. State Expt. Sta.). (*Bot. Gaz.*, 106 (1945), No. 4, pp. 431-440, illus. 5).—At weekly intervals, from 1 to 12 weeks, samples of peach seed were taken from an afterripening chamber maintained at 34°-36° F. and germinated and grown to seedling size at 68°. Some of the plants showed evidence of insufficient afterripening, being dwarfed and producing anomalous leaves. These off-type plants were most frequent in the early samplings and decreased progressively as the weeks passed until all seedlings were normal. The frequency of anomalous plants was higher from nongerminating excised seeds than from germinating nonexcised seeds following the same period of afterripening. The frequency of anomalous plants varied with the variety of peach. Anomalous forms were not the result of photoperiod alone, since both normal and dwarfed seedlings developed from seeds planted the same day. The dwarfed and anomalous growth of seedlings occurred rarely in parts other than the epicotyledonary axis and its appendages. New shoots induced from axillary buds were normal in character.

**Ground spray kills insects and weeds at approximate cost of double disking.** H. M. STEINER (*Pennsylvania Sta. Bul. 464, Sup. 3 (1945)*, p. 10, illus. 2).—Two proprietary materials were found valuable as ground sprays for killing weeds and insects in the peach orchard. A drag sheet was necessary to keep the caustic sprays from the tree foliage and to concentrate the materials where needed. Weeds were killed to the soil level and for the most part recovered in a short period. Among insects killed were grasshoppers, tarnished plant bugs, Japanese beetles, and plum curculios. The cost of a single ground spray approximated that of a double disking.

**Results of thinning peaches with Elgetol and switches.** A. E. MURNEEK and A. D. HIBBARD. (Univ. Mo.). (*Amer. Soc. Hort. Sci. Proc., 45 (1944)*, pp. 69-71).—A comparison of two methods, (1) Elgetol spraying, and (2) physical thinning with elm switches, for reducing the number of blooms on vigorous 7-yr. Elberta trees which had flowered profusely following 2 yr. without a crop, led to the conclusion that both methods are effective on the peach. Concentrations of 0.25 and 0.5 percent of Elgetol were more effective than those of lesser strength. Switch thinning was more laborious than spraying, but would involve no costly spraying equipment or materials.

**Spraying sour cherries for disease affects size and quality of fruit.** F. H. LEWIS and A. B. GROVES (*Pennsylvania Sta. Bul. 464, Sup. 3 (1945)*, pp. 6-7, illus. 2).—The two standard spray materials, namely bordeaux mixture and lime-sulfur solution, have distinct limitations for spraying sour cherries. Bordeaux sprays reduce size and result in dark red cherries high in soluble solids and acids, with a tendency to shrivel badly in dry seasons and occasionally to be injured around the stems. Cherries sprayed with lime-sulfur were slightly larger, a lighter red in color, and were seldom injured around the stem. Fruit scalding in hot weather was increased by the sulfur. An organic material known as compound 341 proved very promising: (1) In leaf spot control, (2) in causing very little or no leaf injury, and (3) in not dwarfing the fruit. Color was, however, abnormally light red and solids content low. Various other materials under test are discussed.

**Species Batorum: The genus Rubus in North America (north of Mexico).** IX, *Rubi argutii [and] Rubi europae peregrini*, L. H. BAILEY (*Gentes Herbarum, 5 (1945)*, No. 9, pp. 591-856+, illus. 129).—This contribution completes the Eubati or blackberries native in North America north of Mexico and the Eurasian species that have become more or less naturalized in the area (E. S. R., 91, p. 392). There is said to be no reason to suppose that hybridity is more frequent in *Rubus* than in related genera.

**Native grapes and their wildlife value.** A. B. MASSEY (*Ia. Polytech. Inst. Bul. 38 (1945)*, No. 9, pp. 20+, illus. 5).—Information is presented on geographical distribution, characteristics of vine and fruit, and value as wildlife food of a number of native grapes. In addition helpful information is presented as to methods of propagation, including growing of seedlings, layers and cuttings, grafting, etc.

**The minor elements in citrus fertilization.** A. F. CAMP, (Fla. Expt. Sta.). (*South. Canner and Packer, 5 (1945)*, No. 5, pp. 8-11, 14-15, illus. 7).—An important change has come about in recent years in the fertilization of Florida citrus trees. In addition to the major elements, nitrogen, phosphorus, and potassium, growers now use magnesium, manganese, copper, and zinc and sometimes boron and iron. The author discusses the function of these various minor elements, the extent of their use, effect on yield and quality of fruit, on increasing resistance to cold, and in preventing various physiological disorders, etc.

**Boron in citrus trees.** A. R. HAAS. (Calif. Citrus Expt. Sta.). (*Plant Physiol., 20 (1945)*, No. 3, pp. 323-343, illus. 8).—Gum was found in the peel of lemon and orange and also about the core in orange fruits produced by trees grown in solution cultures lacking boron. The vessels of the woody tissues of such trees

were often filled with gum; exudations occurred at cut surfaces and in some cases the gum protruded through the bark. Gum exuded from the exposed surface of the pedicel when flowers or fruits were detached. Gum was also observed between the cells in leaves and was involved in leaf distortion.

The tumeric method was found accurate and rapid for determining small amounts of boron in citrus. This method permitted the fractionation of the boron into soluble and insoluble portions in small samples and thereby avoids the interference of large amounts of gelatinous pectin.

Orange juice varied in its boron content according to the location of the tree upon which the fruit was produced. Boron content of grapefruit juice was lower than that of the orange.

The application of various amounts of boron to the soil increased the water-soluble boron in the leaves of navel orange trees and also in the fruit pulp. In dried citrus tissues, a large amount of the boron insoluble in distilled water was soluble in weak acid.

Decreasing the pH of the soil or increasing the deficiency of elements such as nitrogen and potassium increased the accumulation of boron in citrus leaves.

**Relation of yield of oil from peppermint (*Mentha piperita*) and the free menthol content of the oil,** N. K. ELLIS and F. C. GAYLORD. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 451-454, illus. 1).—Because of the material variation in time of maturity from year to year, calendar date is not a satisfactory key to the optimum harvest date for peppermint. Oil content of the leaves increases up to a certain point and then declines rather rapidly. Menthol content of the oil continues to increase throughout the growing season. Analyses of plants cut at different dates suggested that the most favorable time for cutting is when the free menthol content approximates 45 percent of the oil. A viscometric test was devised to permit a ready analysis of the free menthol.

**Studies on various methods of handling chrysanthemum cuttings,** A. LAURIE and S. RAY. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 455-460, illus. 1).—Based on studies in 1943 and 1944, the author reports that potting unrooted cuttings, which had been treated with a solution of indolebutyric acid, in a light, well-drained soil and then benching, eliminates one operation and gives excellent results if the usual good cultural practices are followed. Planting rooted cuttings direct to the bench eliminates one operation but is not as safe as potting unrooted treated and then benching. Rooting cuttings in pots prior to benching has the advantage of eliminating checks in growth after rooting. Rooted cuttings planted direct to the bench at the time of arrival are satisfactory, and if handled carefully work out as well as the use of unrooted cuttings.

The length of roots at the time of potting appeared to be of little significance as long as the stem of the cutting was not allowed to harden before shifting.

**The possibility of producing forcing stocks of lily-of-the-valley in New Hampshire,** W. D. HOLLEY. (N. H. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 461-466, illus. 3).—In April 1942, three strains of lily-of-the-valley characterized as Michigan, New Jersey, and Sawyer (local) were planted at Durham, N. H., in an acid sandy loam recently cleared from forest. Some of the pips were dug in September 1942, heeled in a cold frame during the winter, and then stored at 28° F. in sphagnum or pine shavings until September 1943. Successful forcing was obtained with one lot only, the New Jersey strain stored in pine shavings. Following the digging, the remaining rows were fertilized in various manners.

The remainder of the bulbs were dug in October 1943 and, after grading, were stored at 28° in shavings in apple boxes. One lot was forced in January and a second in March. The January lot gave rather irregular results due probably to unfavorable forcing temperatures. The March lot gave very good results, with

the best strain yielding salable blooms from about 97 percent of the pips planted. The flowers graded mostly select or extra select. Strain appeared more important than fertilizer treatments in the field. The New Jersey strain was outstanding because of uniform length of stem, number of florets per stem, and freedom from blasting. It was evident that stable manure or commercial fertilizers were effective in increasing both stem length and the number of florets, but it was not established whether the increases obtained by chemicals were economically justifiable.

The general conclusion is reached that high quality lily-of-the-valley pips may be produced in southeastern New Hampshire.

**Care of evergreens.** C. H. CONNORS (*New Jersey Stas. Cir.* 497 (1945), pp. 16, illus. 7).—General information is presented on varieties and species, soil requirements, planting, cultural care, fertilizing, pruning, control of insect and disease pests, etc.

## FORESTRY

**The forests of Newfoundland.** W. M. ROBERTSON (*Forestry Chron.*, 21 (1945), No. 1, pp. 11-21, illus. 6).—This report covers a brief reconnaissance of the forest conditions in Newfoundland, where the timbered lands cover some 10,000 sq. miles of the total of 43,000 included in the island.

**Frost pocket and other microclimates in forests of the northern Allegheny Plateau.** A. F. HOUGH. (U. S. D. A. et al.). (*Ecology*, 26 (1945), No. 3, pp. 235-250, illus. 7).—Frost pockets are common in forests of the High Plateau section of the northern Allegheny Plateau in stream valleys and basinlike topography at the heads of drainages; they result from heavy cutting followed by forest fires which denude the land. Once opened these areas persist for years; frost pockets do not exist in the old-growth forests. A distinctive microclimate, due to topography and lack of forest cover, was found characteristic of a frost pocket on the Kane Experimental Forest as compared with a nearby open site and two forested stations. Lower minimums and higher maximums during both winter and summer, a much shorter growing season, and greater diurnal ranges in temperature characterize the frost pocket. The chief influence of topography appears to be the stilling of air and slowing of air drainage, thus facilitating both the heating and cooling of air in the valley bottom. The dense compact crown form of eastern hemlock is said to be a good indicator of frost pocket conditions. Deer and rabbits are factors damaging seedling growth and thus aid in perpetuating these pockets. Unfavorable seedbed conditions and scanty sources of tree seed, as well as injury by unseasonable frosts, are also important in explaining the failure of tree reproduction on these sites. Conversion of such areas to good forest growth depends on complete fire protection, reduction of browsing damage, and possibly the planting of frost-resistant conifers. All existing tree growth in frost pockets should be saved unless a permanent opening is desired for wildlife habitat or other reasons. Partial cutting for cordwood or sawlog products should be the rule in all forests of the High Plateau, and especially on topography susceptible to formation of frost pockets.

**Some soil factors associated with site quality for planted black locust and black walnut.** J. T. AUTEN. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 8, pp. 592-598, illus. 1).—Utilizing a large number of long established plots distributed over a number of States, growth was correlated with the physical and chemical characteristics of the soil. Among conclusions were that soils with slow drainage should be avoided for both species. Slow drainage may be recognized by compact, plastic subsoil, and by grayish or bluish-gray subsoil mottled any color. Excessive dry soil should be avoided for both species. Such areas are indicated by a tight subsoil within a few inches from the surface, by bedrock less than 24 in. from the surface and by coarse, sandy moraines. Clay and silty clay are not as desirable

for both species as are sandy loams, loams, and silt loams. Both species tolerate a wide range in soil reaction between pH 4.6 and 8.2. Lime-derived soils were most satisfactory. Soils without pronounced subsoils are best for both species.

**Availability of soil moisture to ponderosa pine**, H. A. FOWELLS and B. M. KIRK. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 8, pp. 601-604).—Ponderosa pine seedlings, half of which had all root tips clipped, were planted in soils with moisture contents of 8.1, 10.0, and 14.8 percent, covering a range from just above the wilting point to field capacity. Seedlings with clipped roots transpired less moisture for the first month than did those with intact roots. Survival was markedly greater in seedlings with intact roots. These plants were able to become established and grow in soil with a moisture content only 2 percent above the wilting point. The growth of tops and roots of surviving plants was practically the same for the two root conditions. Height growth was about proportional to amount of soil moisture available and to the amount of water transpired. Ponderosa seedlings, grown in the same containers with sunflowers, showed no evidence of wilting when the sunflowers wilted at a soil-moisture content of 7 percent. The pines survived even after the soil-moisture content had been reduced to less than 4 percent. Mortality of planted ponderosa pines may be due not to the severity of climatic factors but to the inability of the root systems to absorb enough available moisture because their root systems have been severely injured in handling and cannot regenerate new roots rapidly enough.

**Response of young Asiatic chestnut trees on different soil types in eastern Maryland**, W. J. LATIMER and J. D. DILLER. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 7, pp. 510-512).—Observations on a limited number of trees planted on 19 sites suggest the importance of soil conditions, particularly water relationships, on the establishment and rate of growth of Asiatic chestnuts. Particularly with reference to soil moisture, the silvical requirements of the Asiatic chestnut resemble those of yellow poplar. Sweetgum may grow on sites too wet and red oak on sites too dry for these chestnuts.

**Propagation of cork oak by grafting**, N. T. MIROV and W. C. CUMMING. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 8, pp. 589-591).—In grafting experiments in the greenhouse cork oak proved compatible with four native California oaks namely, *Quercus chrysolepis*, *Q. kelloggii*, *Q. douglasii*, and *Q. engelmannii*, and incompatible with *Q. agrifolia* and *Lithocarpus densiflora*. Outside trials with *Q. chrysolepis* were also successful provided shading is practiced during the first season and sprouts are removed from the stock.

**Influence of rodents on natural regeneration of Douglasfir in the Southwest**, H. KRAUCH. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 8, pp. 585-589).—A good seed crop in 1940 on and near the Cloudcroft Experimental Forest, New Mexico, afforded an opportunity to observe reproduction on poisoned and control areas. Despite severe losses of seedlings on all plots from unfavorable conditions there were, where rodents were controlled effectively, adequate seedlings to provide adequate restocking. Rodent control is deemed particularly important in the Southwest because of the large number of rodents and the limited seed supply. Furthermore, climatic and environmental conditions are on the whole somewhat unfavorable for seedling establishment.

**Controlled burning in south Jersey's oak-pine stands**, S. LITTLE and E. B. MOORE. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 7, pp. 499-506, illus. 2).—Information obtained in this study in southern New Jersey, combined with more extensive observations of controlled burning throughout the general area, suggest that prescribed burning in the form of light winter fires may be used advantageously in oak-pine stands. The role of such fires appears to be partly in the preparation of the seedbed for pine reproduction and later, when the seedling pines have

attained 3 in. in diameter, in control of the hardwoods. Control of hardwoods has an apparent further value in reducing fuel accumulations, thereby lessening the danger of severe spring fires.

**Tree shelterbelts at a Soviet experiment station,** T. MILLS (*U. S. Dept Agr., Foreign Agr.*, 9 (1945), No. 7, pp. 108-112).—For the past 50 yr., experiments in Russia have been carried on with tree shelterbelts to improve crop production and reduce the hazards of a rigorous, arid climate. Much of this work has been done at Kamenno-Stepnoe station in southeastern European Russia. The experiments there with quadrilateral belts occupying 10 percent of the area to be protected and combined with crop rotations including 20 percent of perennial grasses were found to give the best results.

**Growing stock, cutting age, and sustained yield,** C. E. BEHRE. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 7, pp. 477-483, illus. 3).—The author points out that for a given level of output the required growing stock is a function of cutting age and may be expressed as a multiple of the yield. Growing-stock ratios, deduced from available yield tables and assumptions as to average cutting ages, indicate that the poorly distributed volume of timber the nation now has is not greater than the well-distributed volume of growing stock we shall need in order to maintain the current level of output, to say nothing of attaining a higher potential yield. The author's calculations indicate that the growing stock deficit in the East is most serious in southern pine.

**Cutting cycles in ponderosa pine,** C. MILES. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 7, pp. 508-509).—Data recorded on sample plots on the Boise and Salmon National Forests show an initial period of rapid growth after cutting, followed by a decline of relatively short duration and then a decided upturn. The author concludes that there is no available evidence to indicate that cutting cycles of less than 30 yr. are desirable in the southwestern Idaho belt of ponderosa pine.

**Light cutting in black spruce is practicable,** R. K. LEBARRON. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 7, pp. 486-489, illus. 2).—Windthrow in black spruce growing in swamp is overrated as a cause of mortality following partial cutting. Mortality due to windthrow is about three times as great in heavy as in light cuttings, but is not the major factor in mortality. Of the trees that died 64 percent remained standing. Only 24 percent of the deaths were caused by uprooting and 12 percent by breaking of the stems. Mortality is not a bar to the practice of light cutting. Net annual growth for the 5-yr. period following cutting ranged from 0.88 cord per acre on the most lightly cut area down to 0.04 cord in the 70 percent cutting class. Heavier cutting resulted in negative growth. Cutting not in excess of 30 percent of the merchantable volume of trees over 6 in. d. b. h. is desirable and practicable. Very heavy cuttings destroy practically the productivity of the stands for a long period.

**Harvesting young aspen on the Cloquet forest,** T. SCHANTZ-HANSEN. (Univ. Minn.). (*Jour. Forestry*, 43 (1945), No. 7, pp. 506-507).—Poor quality aspen covering an immense area in the Lake States area constitutes a major problem. This article cites a sale of aspen for wallboard material and indicates that a solution may be found in clear cutting under short rotations wherever there is a market for low grade material.

**Some aspects of appraising standing timber,** J. E. ROTHERY. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 7, pp. 490-498).—The author reviews some concepts and definitions of value, and sets forth a practical refinement of a long-standing method of appraising timber with application confined to determination of stumpage values on a pay-as-cut basis. Avoiding certain weaknesses of the familiar overturn method, this procedure is based on a comparative analysis of expected gross returns,

with provision for profit and risk in accordance with that indicated by actual transactions. The method is shown to be especially useful in appraising mixed stands containing a number of important commercial species that differ in price of products and cost of conversion.

A simple method of determining the specific gravity of veneer, T. K. BYERS (*Jour. Forestry*, 43 (1945), No. 8, pp. 599-600).—This article describes a simple method for determining specific gravity of veneer at an aircraft factory as a basis for rejecting light and brittle materials unsuitable for use. Specific gravity tables covering yellow poplar, birch, and mahogany are included.

## DISEASES OF PLANTS

The Plant Disease Reporter [June 1 and 15 and July 1, 1945] (U. S. Dept. Agr., *Plant Disease Rptr.*, 29 (1945), Nos. 19, pp. 467-504, illus. 5; 20, pp. 505-539, illus. 2; 21, pp. 541-573).—In addition to brief seasonal survey notes from the Emergency Plant Disease Prevention Project relating to such crops as cereals, leguminous and cover crops, tobacco, potato, orchard and small fruits, and trees, and surveys of the accuracy of estimations of plant disease losses (Nos. 19 and 20), the above issues contain the following signed notes and articles:

No. 19.—Host-parasite check list revision, *Polypogon-Saccharum* (Gramineae) and *Rynchospora* (Cyperaceae), by F. Weiss; the microflora of wheat and barley seed grown in Minnesota and the Dakotas in 1944 (including tabulated data and 5 maps), by I. W. Tervet; prevalence and destructiveness of cereal diseases in Arkansas during 1945, by H. W. Larsh; diseases of small grains in Missouri, by T. W. Bretz; armillaria root rot in the Santa Clara Valley of California, by H. Schneider, E. W. Bodine, and H. Earl Thomas (Univ. Calif.); and conifer windbreak and nursery diseases in Illinois, by J. S. Tidd.

No. 20.—Host-parasite check list revision, *Schedonnardus-Sitanion* (Gramineae) and *Scirpus-Scleria* (Cyperaceae), by F. Weiss; late blight of potato epidemic in Kansas, by L. E. Melchers (Kans. State Col.); potential psyllid yellows of potato in the Texas Panhandle, by G. E. Altstatt; bacterial ring rot in potato table stock to be used for seed in Otsego County, Mich., by A. J. Braun; bacterial ring rot and other diseases in potato seed stocks in Wisconsin, by E. E. Honey; diseases and injuries of greenhouse-grown vegetable plants in New York, by R. C. Cassell; *Ausatosporea acerina* found causing decay of stored carrots in Wayne County, N. Y., by W. E. Rader (Cornell Univ.); diseases of small grains in Missouri, by T. W. Bretz; cereal diseases in Nebraska by C. M. Slagg and in Texas by I. M. Atkins; diseases observed on cereals in Kansas by S. M. Pady and in southern Arizona during 1945 by W. C. Hoyman; a new corn disease (possibly of virus nature) in the Rio Grande Valley, by G. E. Altstatt; anthracnose of sycamore and oak in Illinois, by J. C. Carter (Ill. Nat. Hist. Survey); and three phytophthora diseases observed in the region of Tingo Maria, Peru, and nursery root and collar rot of *Cinchona* and root rot of *Canavalia* caused by *Sclerotium rolfsii*, both by B. S. Crandall.

No. 21.—Host-parasite check list revision, *Sorghastrum-Spartina* (Gramineae), by F. Weiss; epiphytotic of potato late blight in Missouri, by T. W. Bretz; diseases of potatoes in southern Arizona during 1945, by W. G. Hoyman; pea root rot in New York, by R. C. Cassell; pea root rot and other diseases in Indiana, by J. S. Tidd; diseases of lettuce and other vegetables observed in northern New Jersey, by A. J. Mix; fungi isolated from moldy sweet cherries in the Pacific Northwest, by H. English; fire blight on pears in northern and central California, by H. Schneider; "brown berry" or mild streak on raspberry in Pennsylvania, by G. L. Zundel (Pa. State Col.); *Pythium aphanidermatum* on Arizona flax in the Salt River Valley, by W. G. Hoyman; and two important flax diseases in California in

1945, by B. R. Houston, and tests on flax varieties and hybrids for resistance to anthracnose, by B. R. Houston and E. H. Stanford (both Univ. Calif.).

Report of the 1945 annual meeting of the New England Division of the American Phytopathological Society (*Phytopathology*, 35 (1945), No. 8, pp. 654-657).—Abstracts of papers by various authors are presented on the following subjects: Dutch elm disease in Massachusetts, control of alternaria blight of tomato, onion control by soil fungicides and seed treatments, fusarium yellows susceptibility of bean varieties, spoilage of Blue Hubbard squash in storage, red spider control by disodium ethylene bisdithiocarbamate, environmental effects on resistant sporangia of *Allomyces arbusculus*, identify and control of stilbaceous mold in illuminating gas-purifying sponge, a grading system for measuring plant diseases, assay of fungicides or genetical differences by intraseasonal advance of disease, and polymodal response curves in biological research.

Diseases of small grains, flax, and several vegetable crops in South Dakota in 1942, W. F. BUCHHOLTZ. (*S. Dak. State Col.*) (*S. Dak. Acad. Sci. Proc.*, 23 (1943), pp. 65-76).—A brief summary of the damage to these South Dakota crops by diseases during 1942 and of weather conditions associated therewith.

[*Symposia on plant diseases*] (*Canad. Phytopathol. Soc. Proc.*, 12 (1944), pp. 13-23).—Brief abstracts are presented of symposia on extension work in plant pathology, bacterial ring rot of potatoes, seed-borne diseases, and virus diseases of tree fruits.

Techniques for soil fungus studies, I. D. BLAIR (*New Zeal. Jour. Sci. and Technol.*, 26 (1945), No. 5, Sect. A, pp. 258-271, illus. 13).—Published literature (25 references) relating to direct microscopic examination of organisms in soils is reviewed. An application of the Rossi-Chodlony glass slide technic was found successful in providing a procedure for examining growth of *Rhizoctonia solani* in natural soil; direct examination in tubes was also found possible. The technics are described, and the photographic figures presented illustrate some of the growth studies which may be developed through use of such methods.

Soil disinfection, I, II, H. JACKS (*New Zeal. Jour. Sci. and Technol.*, 26 (1944), No. 4, Sect. A, pp. 186-189; 26 (1945), No. 6, Sect. A, pp. 357-358).

I. Preliminary report on control of eelworm.—Cresylic acid, naphthalene, formalin, calcium chlor-acetate, carbon disulfide, chloropicrin, D-D, and silver proteinite were tested for efficacy as soil disinfectants. Chloropicrin gave good control of nematodes, and formalin delayed their activity sufficiently to allow good plant growth. Carbon disulfide gave poor control of nematodes; D-D and cresylic acid, although controlling eelworm, caused root injury and call for further investigation.

II. Preliminary report on control of damping-off.—Soil artificially infested with *Pythium ultimum*, cause of damping-off of tomato seedlings, was treated with steam, formalin, chloropicrin, and D-D; the last two were applied by injection (1) directly into seed boxes and (2) into soil held in a closed container. Chloropicrin, formalin, and steam gave complete control and the first two caused improved plant growth; D-D gave contradictory results and is under further investigation.

Quantitative bioassay of fungicides in the laboratory, J. G. HORSFALL. (Conn. [New Haven] Expt. Sta.) (*Bot. Rev.*, 11 (1945), No. 7, pp. 357-397).—The purpose of this review (125 references) has been to set down and to evaluate critically the progress that has been made in designing proper equipment to reach conclusions regarding fungicidal action; the discussion is limited primarily to the laboratory technics and especially to bioassay procedures devised for testing chemicals, the action of heat being omitted. The word fungicide is here used in the broadest sense, meaning to kill or inhibit the fungus or to prevent its effects. Discussion in the text is presented under objectives in the bioassay of fungicides, role of fungicides

in controlling fungi, prophylaxis, chemotherapy, mechanisms of fungicidal action, assaying the physical and the chemical factors in fungicidal action, the yardstick of fungicidal potency, and some practical predictions already made.

Effect of sodium cyanide on number of fungi, bacteria, and *Actinomyces* in soil and its value in the control of damping off of seedlings, nematodes, and cabbage root worm, M. M. McCool (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 10, pp. 463-472, illus. 2).—The number of fungi in soil from a vegetable garden was at first reduced by adding 250 and 500 p. p. m. of sodium cyanide; after 14 days, an increase resulted from adding 125, after 28 days from 250, and after 56 days from 500 p. p. m. The total number of bacteria and *Actinomyces* in the soil was reduced 2 days after adding 50 and 100 p. p. m. and growth prevented by adding 200 and 400 p. p. m. of sodium cyanide. Addition of 0.004 gm. or more in solution to dry soil liberated sufficient HCN in 1-qt. Mason jars to prevent growth of *Alternaria* sp. and *Cunninghamella blakesleiana* in tubes of agar. On transfer to sterilized agar, however, growth followed in each case within 8 days, except for *Cunninghamella* taken from cultures to which 0.006 gm. of cyanide had been added. Six fungi causing damping-off of seedlings were prevented from developing in soil cultures to which 800 or more p. p. m. had been added, where the containers were not sealed; when sealed for 48 hr., 200 or more p. p. m. prevented development. Cultures of *Cunninghamella*, *Alternaria*, and *Macrosporium* were taken from soil treated with different amounts of sodium cyanide; growth of each occurred after they had been for 6, 24, and 48 hr. in soil treated with 150 and 200 p. p. m.; on exposure for 96 hr., however, growth was not discernible 6 days after cultures were transferred to sterilized agar. Damping-off in cabbage and pea seedlings was partially controlled by adding 200 and 300 p. p. m. of sodium cyanide to the soil when the containers remained sealed for 48 hr. after treatment. Placement below the seed of 0.06, 0.09, 0.12, and 0.15 gm. of sodium cyanide per linear foot partially controlled damping-off in cabbage and 0.075, 0.10, and 0.125 gm. that in tobacco seedlings. Sodium cyanide proved effective in controlling nematodes attacking roots of tomatoes when applied 7 in. below the surface and when the receptacles remained sealed for 72 hr. before removing the soil and setting the plants therein. For the agronomic relationships see page 714.

Application of penicillin to crown gall, J. G. BROWN and A. M. BOYLE. (Univ. Ariz.). *Phytopathology*, 35 (1945), No. 7, pp. 521-524, illus. 2).—Crude penicillin, produced by the authors and assaying six Oxford units, cured soft galls on stems of *Bryophyllum* produced by inoculating with a pure culture of *Agrobacterium tumefaciens*. Treatment was effected by wrapping the galls with cotton wool soaked with the drug. Evidently the treatment killed not only the parasite but also the proliferating cells of the gall. Results are noteworthy because the parasite concerned is gram-negative and crown gall is commonly regarded as incurable.

A virus tumor disease of plants, L. M. BLACK (*Amer. Jour. Bot.*, 32 (1945), No. 7, pp. 408-415, illus. 9).—Discovery of the new plant virus *Aureogenus magnivena* and its transmission by agallian leafhoppers has been reported previously (E. S. R., 92, p. 520); the tumors produced by it on the roots of many suspects are here described and illustrated. The overgrowths tended to be spherical and woody. Depending on the species affected, they ranged in size up to 1 cm. in diameter and were so numerous on some roots as to become fused together. On other species only a few scattered tumors arose, and on still others a cluster appeared on a single lateral root, other roots on the plant appearing healthy. In one species the root tumors were a deep purple although the normal was almost white. There appeared to be a definite connection between the root tumors and the emergence points of the lateral roots. On white sweetclover, tumors appeared on the stems as well as the roots. On most species the veins of the leaves were irregularly

enlarged, and—on many—various overgrowths such as enations or vein tumors were formed on the lower side. Tumors were also produced on the crowns of some hosts and on the petioles of others. The virus was found to infect 43 species of plants in 20 families, and it is believed that many more suspects remain to be discovered. It is suggested that the names "wound-tumor disease" and "wound-tumor virus" for the disease and the pathogen, respectively, are preferable to "clover big-vein" and "clover big-vein virus."

Respiratory behavior of bacteria-free crown-gall tissues, P. R. WHITE (*Cancer Res.*, 5 (1945), No. 5, pp. 302-311, illus. 2).—Studies by the Barcroft-Warburg method on the respiration of healthy vegetative growing points, inflorescences, and internodes of sunflower; of pathological tissues of the same plant represented by crown gall tumors containing active colonies of *Phytomonas tumefaciens*, secondary tumors free of bacteria, tertiary (metastatic, graft) tumors arising as a result of implantation of bacteria-free tumor tissue cultures under the bark of healthy plants, and tissue cultures from bacteria-free secondary tumors; and of genetically tumefacient tissues of the hybrid, *Nicotiana langsdorffii* × *N. glauca*, tissue cultures from the meristem of this hybrid, and tumors arising as a result of implantation of such tissue cultures under the bark of *N. glauca* led to the conclusion that these various pathological states do not result in any apparent significant qualitative change in the respiratory picture, but do result in a definite lowering of the respiratory level. If this lowering is real and not merely an artefact due to the greater amount of nonliving tissue present in pathological growths, it may be considered similar in kind to long recognized characteristics of animal neoplasia.

Notes on seed-borne fungi.—III. Curvularia, J. W. GROVES and A. J. SKOLKO (*Canad. Jour. Res.*, 23 (1945), No. 3, Sect. C, pp. 94-104, illus. 18).—In continued examinations of agricultural seeds (E. S. R., 92, p. 516), five species of *Curvularia* were isolated, viz., *C. geniculata*, *C. inaequalis*, and *C. trifolii*, which were identified by comparisons with types; and *C. lunata* and *C. pallescens*, which were provisionally identified from the literature. The types of four North American species—*C. geniculata* (*Helminthosporium geniculatum*), *C. inaequalis* (*H. inaequalis*), *C. trifolii* (*Brachysporium trifolii*), and *C. fulcata* (*Acrotheicum fulcatum*)—have been examined. *H. cymbopogi* is here transferred as *C. cymbopogi* n. comb. The species isolated from seeds are apparently not of serious pathological significance.

Nutrient requirements in the germination of the conidia of *Glomerella cingulata*, C.-K. LIN (*Amer. Jour. Bot.*, 32 (1945), No. 6, pp. 296-298).—Normal germination of cleaned conidia was obtained in a full nutrient solution composed of dextrose, MgSO<sub>4</sub>, NH<sub>4</sub>NO<sub>3</sub>, and KH<sub>2</sub>PO<sub>4</sub>; C, Mg, N, P, and S proved indispensable and the minimum requirement of N and P was of the order of 10<sup>-4</sup>γ per spore. It was not found possible to demonstrate the indispensability of K; nor was there evidence that external supplies of any organic substances other than sugar were necessary. This is believed to be the first report on mineral nutrition in the germination of fungus spores.

Notes on four eastern species of *Gymnosporangium*, W. H. LONG (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 6, pp. 182-188, illus. 2).—Notes are presented on the prevalence, distribution, and effects on the host plants in the District of Columbia and neighboring areas of the rust fungi *G. clavipes*, *G. nidus-avis*, *G. effusum*, and *G. juniperi-virginianae*. Inoculation trials failed to determine the aecial host of *G. effusum*, but it is suggested that one or more of the species of *Crataegus* listed for *G. hyalinum* be tested.

Turf and lawn diseases, H. L. KEIL (*Rhode Island Sta. Misc. Pub.* 26 (1945), pp. 19-21).—Suggestions are given on control of dollar spot, brown patch, and other turf diseases.

The mode of infection and the incubation period in the stem smut of grasses, *Ustilago spegazzinii* (U. *hypodytes*), G. W. FISCHER. (Wash. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 35 (1945), No. 7, pp. 525-532).—Seed and blossom inoculations with *U. spegazzinii* and *U. spegazzinii agrestis* on crested wheatgrass, slender wheatgrass, and Canada wild-rye failed, but a high level of infection was obtained by inoculating clipped plants with spore suspensions of stem smut from several grasses of the tribe Hordeae, thus showing that in nature the smut fungus probably infects its hosts through the vegetative tissues. The period of incubation was at least 2 and most often 3 yr. The fungus is perennial in the host. The source of infection of the many grass species affected with stem smut in the Pullman region is thought to be in the local common heavy infestations in quackgrass.

The black stem disease (Ascochyta) of alfalfa and related diseases on peas and vetch in 1945, C. M. HAENSELER (*New Jersey Sta. Plant Disease Notes*, 22 (1945), No. 6, pp. 21-24).—Seasonal notes are presented.

Physiologic specialization in *Helminthosporium gramineum* Rabh., D. C. ARNY. (Univ. Wis.). (*Phytopathology*, 35 (1945), No. 7, pp. 571-572).—The barley variety Atlas has been reported resistant to stripe in Wisconsin, but recently a culture pathogenic to it was isolated from Wisconsin material. In repeated tests Atlas (C. I. 4118) was susceptible to this new culture, and Oderbrucker (C. I. 4666) was highly resistant. Atlas was resistant to the old cultures which had been used for a number of years in testing varieties, while Oderbrucker was susceptible to these same cultures. Colsess IV (C. I. 5979) was susceptible to both the new and the old cultures. The reciprocal reaction of Atlas and Oderbrucker showed that the new culture was pathogenically distinct from the old cultures.

A simple method of inoculating barley with loose smut, J. M. POEHLMAN. (Univ. Mo.). (*Phytopathology*, 35 (1945), No. 8, pp. 640-644, illus. 1).—By the simple procedure described, inoculum of *Ustilago nuda* is prepared by straining smut chlamydospores through cheesecloth and making a spore suspension in tap water plus 1 percent dextrose. After pollination, this suspension is injected into the barley florets with a hypodermic needle fitted into a rubber bulb. Infections reported in a wide range of varieties indicate that the method may be used by the breeder for sorting out susceptible and resistant varieties or selections.

A preliminary report on further studies of physiologic specialization in *Ustilago hordei*, T. F. YU and C. T. FANG (*Phytopathology*, 35 (1945), No. 7, pp. 517-520).—The authors obtained 84 collections of covered smut of barley from many places in China and inoculated 14 varieties of barley with most of them; 9 physiologic races of *U. hordei* were recognized by their parasitic behavior on 4 of these varieties. Races 1 and 2 were collected more often than the others, but detailed analysis of the distribution and prevalence of the physiologic races found in China can be made only after more records are available. It is believed that there are other races which could be recognized if more collections were made and more differential hosts inoculated.

Note on gall formation in decapitated young bean plants, L. H. FLINT and C. F. MORELAND. (La. State Univ.). (*Plant Physiol.*, 20 (1945), No. 3, pp. 453-456, illus. 1).—Greenhouse tests with decapitated young bean plants under various experimental conditions indicated that the formation of galls was not essentially correlated with the action of extraneous agents, such as growth substances or crown gall bacteria. The findings were interpreted as evidence that under some experimental treatments the action of natural wound hormones might modify, condition, or obscure the extent or nature of the gall development considered as a plant response to an applied growth substance.

*Nigrospora oryzae* (B. and Br.) Petch on maize, J. H. STANDEN. (Iowa Expt. Sta.). (*Phytopathology*, 35 (1945), No. 7, pp. 552-564, illus. 3).—*N. oryzae* infection was initiated in poorly matured tissues following cessation of translocation,

arrested axillary shoots and poorly developed secondary ears being most frequently infected. Lodging, stalk and root rots, and early frost were among the factors contributing to poor maturity. The pH of the cob—near 5.5 early in development—dropped to 4.5 or lower in well matured cobs. The pH and the *Nigrospora* susceptibility of poorly matured cobs remained high; thus pH, because it was an index of cob maturity was at the same time an index of *Nigrospora* susceptibility. The abundant inoculum present in arrested axillary shoots was shown to remain viable late in the following season, probably constituting a major source of infection. Many slight infections were detected in the ears; these—with sufficient moisture and warmth—might have invaded the seed; this would indicate the importance of early gathering and drying of seed corn.

The invasion of the internal structure of cotton seed by certain *Fusaria*, B. A. RUDOLPH and G. J. HARRISON. (Calif. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 35 (1945), No. 7, pp. 542-548).—Several *Fusariums* appear to be innocuous concomitants of healthy cottonseed, reaching it via the xylem which they seemingly inhabit as saprophytes—the plants showing no disease symptoms whatever. Two species have been identified as *F. moniliforme* and *F. oxysporum*; a third—*F. scirpi*—is capable at times of producing a soft, brown rot of immature seeds, and a fourth remains unidentified. It is believed that a more detailed study would have revealed additional species or strains.

Curly-top and California-aster-yellows diseases of flax, H. H. P. SEVERIN and B. R. HOUSTON. (Univ. Calif.). (*Phytopathology*, 35 (1945), No. 8, pp. 602-606, illus. 4).—Spontaneous infection of cultivated flax by the curly top virus was first observed in March 1944 in fields of central California. The plantings most severely affected were those of October and November; these were in the seedling stage when the beet leafhopper vector began its fall migration from the valley. On affected seedlings the production of irregularly shaped wavy leaves closely grouped near the growing point was followed by a gradual yellowing of the entire plant and death. Larger plants when infected often continued to grow and produce these leaf symptoms accompanied by a marked coiling of the tip of the stem, causing the plant to have a more prostrate growing habit than normal. The flowers on affected plants failed to open, leaving the petals pressed together. The petals were twisted and puckered by small blisterlike elevations over their entire surface. The virus was recovered from spontaneously infected flax by previously noninfective beet leafhoppers and transferred to healthy sugar beets, which developed typical curly top symptoms. Flax grown from seeds was experimentally infected with the California aster yellows virus via both the short-winged and long-winged races of *Macrostcles divisus* (Uhl.). Symptoms exhibited were yellowing of the apical leaves, secondary shoots arising from leaf axils, virescence and proliferation of the flowers, and a reduction in size of petals or their complete absence.

The field reactions of certain oats hybrids and varieties to stem rust, M. B. MOORE, H. K. HAYES, and E. C. STAKMAN. (Minn. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 7, pp. 549-551, illus. 1).—Oats varieties and lines having Rainbow, Iogold, or Richland for one of their parents and hitherto showing field resistance to *Puccinia graminis avenae* were found to have a noticeable number of large susceptible-type pustules from which races 8 or 10 or both were identified. Varieties and lines deriving their stem rust resistance indirectly from White Russian remained resistant or semiresistant under the same conditions. It is pointed out that other investigators have believed that resistance to races 1, 2, and 5—and possibly 8 and 10—is allelic to resistance to races 1, 2, 3, 5, and 7 in certain varieties; also that resistance at low temperatures to all races has been obtained in other varieties. The need for further efforts to obtain varieties with resistance to all races is emphasized, as is also the desirability of eliminating barberries as breeding grounds for the rust fungus.

The control of potato late blight tuber rot, R. BONDE and E. S. SCHULTZ. (Maine Expt. Sta. and U. S. D. A.). (*Amer. Potato Jour.*, 22 (1945), No. 6, pp. 163-167).—A survey in 1944 showed that about 10 percent of the potato crop of Aroostook County, Maine, rotted in storage because of late blight tuber rot; much of this resulted from harvesting while the fungus was still viable and before the plants were completely dead. Many farmers fail to detect the disease when present in small amounts on partially dead stalks and leaves, or they consider that such small amounts will cause no loss. It should be realized that a light infection on the foliage may cause heavy losses in the bin, the freshly dug tubers becoming inoculated as they are dug. The amount of tuber rot may be greatly reduced by delaying the harvesting until the plants have been killed by frost. Although growers often fail to wait until the vines are dead from natural causes, when late blight is present the tops should be killed by spraying with a herbicide or harvesting only after the foliage is dead from maturity or freezing.

The effect of rugose mosaic on the yield of potatoes, J. G. BALD (*Phytopathology*, 35 (1945), No. 8, pp. 585-590, illus. 1).—In two experiments at Canberra, Australia, leaf areas and final yields were measured on plants infected with viruses X and Y and on "normal" plants containing virus X. The reduction in yield due to virus Y was proportional to the reduction in leaf area measured during a period after the initiation of tuber formation. The yield of tubers weighing over 2 oz. was reduced by infection with virus Y more than the total yield, since the reduction in numbers of tubers was proportionately less than that of leaf area.

Virus C from an old Australian variety of potato, J. G. BALD and D. O. NORRIS (*Phytopathology*, 35 (1945), No. 8, pp. 591-597, illus. 1).—A virus isolated from an old Australian variety is described and identified with virus C. Its physical properties and host range—also described—ally it closely with virus Y, but, except possibly in rare instances, it is not transmissible by the most efficient vector of virus Y, viz., the green peach aphid. The virus is believed unlikely to become widespread or to produce serious losses in potato crops.

Seed disinfection.—VI, Stripe smut of rye, R. E. TAYLOR and W. A. R. DILLON WESTON (*Jour. Agr. Sci. [England]*, 35 (1945), No. 2, pp. 116-118).—In this further study (E. S. R., 90, p. 62), the occurrence in Great Britain of infection by *Urocystis occulta* is recorded. Control of this seed-borne smut of rye by disinfecting the seed with an organic mercurial prior to sowing was successful. Experimental confirmation was also had that it may be soil-borne.

Smut control in sorghum and effect of dust fungicides and storage on emergence, R. W. LEUKEL and J. E. LIVINGSTON. (Nebr. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 35 (1945), No. 8, pp. 645-653).—In the field tests of 1943, emergence of Sharon kafir was improved by seed treatment with N. I. Ceresan, copper carbonate, Sperton, Arasan, DuBay 1452-C, Leytosan, and morpholine thiuram disulfide. In Leoti sorghum, emergence was increased by copper carbonate (2 oz.), Arasan (1 and 2 oz.), and DuBay 1452-C ( $\frac{1}{4}$  oz.) and significantly reduced by N. I. Ceresan ( $\frac{1}{2}$  oz.), DuBay 1452-C ( $\frac{1}{2}$  oz.), Merc-o-dust, and sulfur. Increases in both varieties were obtained in 1944 with N. I. Ceresan, copper carbonate, Arasan, Sperton, U. S. R. 604, Fermate, Zincate, and basic copper sulfate. With only 22.3 and 13.2 percent infection in Sharon and Leoti, respectively, all nine dusts in 1943 controlled covered kernel smut (*Sphacelotheca sorghi*) fairly well except Merc-o-dust, which proved entirely ineffective. In 1944, with 61.3 percent smut in Sharon kafir grown from untreated seed, infection was reduced to less than 1 percent by N. I. Ceresan ( $\frac{1}{2}$  oz.), copper carbonate (1 oz.), Sperton (1 oz.), U. S. R. 604 (1 oz.), and basic copper sulfate (2 oz.). Arasan (at 2 oz. per bushel) reduced infection to 1.1 percent; Zincate, Fermate, and sulfur were less effective. Under conditions favoring severe infection only the volatile mercury dusts—DuBay 1452-F ( $\frac{1}{2}$  oz.) and N. I. Ceresan ( $\frac{1}{2}$  oz.)—approached satisfactory

smut control in a variety (Scarborough broomcorn) having seed with persistent glumes, while copper carbonate (3 oz.), Arasan (1 oz.), and Spergon ( $\frac{1}{2}$  oz.) allowed 31.7, 39.3, and 48.2 percent smut, respectively, in this variety. Treated and untreated seed of five sorghum varieties was stored at 20° C. and 70 percent relative humidity for 180 days. In germination tests made at 20° in steamed soil after 2, 20, 40, 80, and 180 days' storage, Arasan, copper carbonate, and Spergon either improved or did not impair emergence, while N. I. Ceresan reduced emergence significantly in three varieties and improved it in one. In unsterilized soil the protective effect of N. I. Ceresan, in general, outweighed its harmful effects; the other three fungicides improved emergence significantly. Sulfur caused some injury and no improvement.

A comparison of dosages of copper carbonate and ethyl mercuric phosphate with chloranil and sulfur as sorghum seed treatments, W. F. BUCHHOLTZ. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 23 (1943), pp. 56-64).—Copper carbonate (18 percent) at 0.25, 0.5, standard, and double dosages and ethyl mercuric phosphate at the same dosages for 1 and 5 percent concentrations were compared with chloranil and with sulfur at 3 oz. per bushel as seed treatments for Sooner Milo grain and 39-30-S sorghum. For smut control,  $\text{CaCO}_3$  at all four dosages, chloranil, and sulfur proved satisfactory. Ethyl mercuric phosphate accomplished only partial control at below standard dosages but was satisfactory at standard dosages, or above, against all but the heaviest spore loads. For seed protection and subsequent yield effects,  $\text{CaCO}_3$  at all dosages, chloranil, and ethyl mercuric phosphate at all dosages were satisfactory, and probably in the order named. Sulfur was unsatisfactory because of its apparent toxicity to the germinating seed.

Tobacco anthracnose, a plant bed and field disease, E. A. WALKER and E. W. McINROY. (Md. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 8, pp. 598-601, illus. 2).—The authors present what is believed to be the first report of anthracnose in commercial tobacco plant beds and fields of Maryland. *Colletotrichum* sp. and *Gloeosporium* sp. were isolated from both stems and leaf midrib cankers, as well as from leaf spots on Maryland Medium Broadleaf tobacco. Inoculations on tobacco, pokeweed, tomato, and potato leaves gave anthracnose symptoms, and *Colletotrichum* sp. was recovered. The disease kills young seedlings. Cankers on stalk and leaf midrib and spots on the leaves are noticeable. Lesions were observed on the flower head and seed pods; infection is thus believed to be seed-borne.

Flue-cured tobacco resistant to bacterial (Granville) wilt, T. E. SMITH, E. E. CLAYTON, and E. G. MOSS. (Coop. N. C. Expt. Sta. et al.). (*U. S. Dept. Agr. Cir.* 727 (1945), pp. 7, illus. 4).—By crossing T. I. 448—a tobacco previously reported as highly resistant—with flue-cured varieties of high quality, it became possible to select out lines combining high wilt resistance and good flue-cured quality. The best of these lines is now being released as Oxford 26. On wilt-infested soil, it has yielded five times as much as the standard susceptible Gold Dollar variety and on "healthy" soil the yield of the two was about the same. The cured tobacco of Oxford 26 was of excellent cigarette quality. The leaves were slightly shorter than those of the ordinary varieties, and there was a higher percentage of the Oxford 26 leaves in the lug grade.

Formation of necroses on leaves of a hybrid *Nicotiana tabacum*  $\times$  *N. glutinosa*, induced by the virus of tobacco mosaic under conditions of plasmolysis, K. S. SUKHOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 46 (1945), No. 1, pp. 34-35).—In the experiment described, the effect of intense plasmolysis was to reduce the number of necroses in inoculated leaves but at the same time to cause these necrotic spots to increase rapidly in size as compared with controls. The latter result is believed to be associated with gradual accumulation of the virus and its diffusion within the tissues, the virus supposedly accumu-

lating more rapidly in plasmolyzed than in normal tissues. The possibility of a biochemical effect of the sugars used to induce plasmolysis is not precluded, but the fact that similar results were obtained with solutions of mono- or disaccharoses, normal or invert sugars, led to the supposition that in all these cases a similar mechanism was operative and that this mechanism was associated with plasmolysis and with the consequent dehydration of the protoplasm.

Breeding for bunt resistance in Australian wheats, A. T. PUGSLEY (*Jour. Austral. Inst. Agr. Sci.*, 11 (1945), No. 1, pp. 28-34).—Trials conducted with a number of American and Australian wheats indicated that while none of the latter proved superior in resistance to Florence, many American varieties were resistant to the bunt races contained in the mixed inoculum used. An analysis was made of several Australian collections of *Tilletia levis* and *T. tritici* in an attempt to relate them to the races of Holton and Rodenhiser (E. S. R., 87, p. 71). A back-cross breeding program aimed at incorporating bunt resistance into commercial Australian wheats is outlined and the progress thus far made indicated.

Further studies on the occurrence and distribution of physiologic races of *Tilletia foetida* in Kansas, E. D. HANSING and L. E. MELCHERS. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 48 (1945), No. 1, pp. 71-78, illus. 1).—In further studies of bunt (E. S. R., 72, p. 793), differential wheat varieties were inoculated with 100 collections of *T. foetida* from 57 counties to determine the number, prevalence, and distribution of its physiologic races in Kansas; among them, 82 were classified as L-3, 1 as L-4, 7 as L-5, and 10 as L-7. Use of the differential varieties in some cases reduced and in one case increased the number of races known to occur in the State. It is clear that determination of physiological races of *T. foetida* and their prevalence and distribution in Kansas is of paramount importance in connection with present and future breeding of resistant varieties of wheat.

New fungicides for old diseases of vegetables, J. D. WILSON. (Ohio Expt. Sta.). (*Ohio Veg. and Potato Growers Assoc. Proc.*, 30 (1945), pp. 65-70).—Brief descriptions are given of some of the newer fungicides—such as Arasan, Fermate, Methasan, Dithane, Spergon, and Puratized—with summaries on their advantages and some of the diseases which they control.

Plant nutrition in relation to disease development.—I, Cabbage yellows, J. C. WALKER and W. J. HOOKER. (Univ. Wis. and U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 6, pp. 314-320, illus. 2).—The rate and development of yellows were studied in young cabbages growing in quartz sand cultures irrigated with nutrient solutions varying in salt concentration and in balance of N, P, and K; the plants represented a very susceptible, an intermediate, and a highly resistant strain. The salt content of the basal Hoagland solution (H) was decreased by one-half, one-tenth, and one-twentieth and increased by two and three times. There was usually an increase in growth up to 1H or 2H and then a decline at 3H. In one test set up for statistical analysis, there was no significant difference between the fresh weight of tops of uninoculated plants at 0.5H, 1H, and 2H, but the weights in that group were significantly higher than those at 0.1H and 3H. Except at the low concentrations there was a progressive decline in rate of disease development in the susceptible strain with increase in salt concentration; the rate was also slower at 19° than at 25° C. While the disease development curves had the same relation to each other at 25° as at 19°, they were closer together after 20 days at 25°. With intermediate resistant plants, inherent host resistance suppressed the disease almost completely at 19° and no effect of salt concentration could be measured; at 25° the curves for four of the five nutrient concentrations followed closely the shape of those for the susceptible strain. When K was omitted the rate of disease development increased in the susceptible strain at 19° and 25°;

when N and P were omitted the rate decreased in the susceptible strain at 19° and 25° and in the intermediate strain at 25°. In the highly resistant strain no signs of disease developed at any salt concentration or balance of N, P, or K. Suppression or enhancement of yellow development by change in salt concentration or balance was not found correlated with rate of growth of the host.

The reaction of 21 species in the Cucurbitaceae to artificial infection with cantaloupe powdery mildew (*Erysiphe cichoracearum* DC.), T. W. WHITAKER and D. E. PRYOR. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 7, pp. 533-534).—Greenhouse inoculation tests of the reactions of 21 species in 11 genera indicated 7 species to possess a high level of resistance: *Citrullus vulgaris*, *Cucumis anguria*, *Cyclanthera explodens*, *C. pedata*, *Ecballium elaterium*, *Luffa acutangula*, and *L. aegyptiaca*. Ten species were intermediate or contained plants high, intermediate, or low in resistance: *Benincasa hispida*, *Bryonia dioica*, *Cucumis melo*, *C. sativus*, *Cucurbita pepo*, *C. moschata*, *C. maxima*, *C. ficiolia*, *Eschinocystis macrocarpa*, and *Trichosanthes anguina*. Four species had a low level of resistance: *Cucumis metuliferus*, *Cucurbita palmata*, *C. foetidissima*, and *Lagenaria leucantha*. No plants were found with a higher degree of resistance than that possessed by some plants of *Cucumis melo*.

**Anthracnose of garden pea**, S. H. OU and J. C. WALKER. (Univ. Wis.). (*Phytopathology*, 35 (1945), No. 7, pp. 565-570).—*Colletotrichum pisi* has occasionally been interpreted as a serious pathogen of pea in Wisconsin, but in a majority of extensive isolations *Ascochyta* spp. were isolated along with it from so-called typical anthracnose lesions. In greenhouse inoculation tests no stem infections were secured except for feeble development around needle wounds, while infection in leaves was confined to the mature or senescent; detached pods were attacked when inoculated in a moist chamber. When stems were inoculated with a mixture of spores of *Mycosphaerella pinodes* and *C. pisi*, or when those of the latter were applied several days after inoculation with the former, the resulting lesions were similar to young "anthracnose" lesions secured in the field. Studies of *C. pisi* on leaves and stems showed that although conidia germinated readily and appressoria were formed, only a small percentage of the latter produced penetrating hyphae on leaves, while no penetration was observed on stems. It is concluded that, in the main, *C. pisi* acts as a secondary pathogen in the field, particularly insofar as the conspicuous stem lesions are concerned. Five out of 1,200 seeds from naturally infected pods yielded *C. pisi*, showing that it may be seed-borne.

"*Phytophthora capsici*" en frutos de "zapallito de tronco" [*P. capsici* on squash fruits], R. E. PONTIS (*Rcv. Argentina Agron.*, 12 (1945), No. 1, pp. 17-21, illus. 1; *Eng. abs.*, p. 20).—This is believed to be the first report of *P. capsici* on winter squash fruits. The experimental work is detailed, and the symptoms are described.

**The treatment of little-leaf of deciduous fruit trees**, K. M. WARD (*Queensland Jour. Agr. Sci.*, 1 (1944), No. 4, pp. 59-76, illus. 6).—Following identification of little leaf of deciduous fruit trees in the Stanthorpe (Queensland) District as a disorder due to zinc deficiency, experiments were conducted to determine the best methods of control. A winter spray consisting of 5 or 2.5 percent of  $ZnSO_4$  gave satisfactory responses within a few months; spring foliage sprays containing up to 2 percent had little or no immediate beneficial effect. Winter sprays not only gave an earlier response but also had more lasting results. Broadcasting and plowing in of 5 lb.  $ZnSO_4$  around an affected tree was followed by beneficial effects in the second and third year afterwards; tree injections proved unsatisfactory. The application of these experimental results to orchard practice is discussed, with the conclusion that winter spraying is preferable to the other methods tried, and that its combination with soil treatment would probably be preferable to winter spraying alone for early treatment of the disorder.

**Transmission of peach wart to sweet cherry**, S. M. ZELLER and J. A. MILBRATH. (Oreg. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 8, pp. 607-609, illus. 2).—The peach wart disease—observed on Improved Elberta trees in western Oregon—was transmitted to seven peach varieties and to Black Republican, Lambert, and Napoleon (Royal Anne) sweet cherry trees. The symptoms in sweet cherry leaves and stems are described. The virus was also transmitted from sweet cherry back to peach without apparent attenuation of the virus in cherry.

**Anatomy of buckskin-diseased peach and cherry**, H. SCHNEIDER. (Univ. Calif.). (*Phytopathology*, 35 (1945), No. 8, pp. 610-635, illus. 10).—The author describes and illustrates the anatomy of peach and cherry (*Prunus avium* on *P. avium* and *P. mahaleb* stocks) infected with strains of buckskin virus from orchards in central and northern California. Necrosis of sieve tubes accompanied by wound gum formation was the typical anatomical change in peach stems. The wound gum proved insoluble in several solvents, but was removed by alternate treatment with  $\text{Na}_2\text{SO}_4$  and  $\text{Cl}_2$  water. Other less frequently observed anatomical changes were necrosis of the outer row of primary phloem fiber initials, necrosis and hypertrophy of parenchyma cells, disturbance of the orderly arrangement of the cambium, and formation of gum pockets in immature xylem. The normal ontogeny of the phloem was also disturbed. In stem cankers an area involving part or all of the tissues of the bark died and gum pockets were present therein. The swollen leaf veins were characterized by necrotic sieve tubes and newly produced phloem tissue. Swollen veins were also produced after ringing peach stems or after grafting peach on Myrobalan (*P. cerasifera*) stock. Sieve tube necrosis accompanied by wound gum formation occurred in buckskin-infected sweet cherry trees on Mahaleb stock. Necrosis was most severe just below the bud union. Similar observations were noted when infected *P. cerasus* and *P. mollis* trees were on Mahaleb stock. In healthy sweet cherry trees on this stock the Mahaleb sieve tubes formed callus first in the fall, and some sieve tube necrosis occurred in the sweet cherry tops and to a less extent in the Mahaleb stock. In the orchard no sieve tube necrosis occurred when *P. avium* roots were used on either diseased or healthy trees; some sieve tube necrosis did occur, however, in infected greenhouse trees on this stock.

**Bacterial-spot of plum and peach**, W. D. REID (*New Zeal. Jour. Sci. and Technol.*, 26 (1945), No. 6, Sect. A, pp. 359-366, illus. 5).—Infection of Japanese plums by *Xanthomonas pruni* is said to be prevalent in New Zealand; the symptoms and incidence and the physiological reactions of the organism are presented. In spray tests, bordeaux (1.5-3-50) decreased infection from 27.85 to 7.8 percent without serious damage to the foliage; zinc sulfate gave a significant decrease in infection but, because of accompanying foliage damage, is of doubtful practical value.

**"Podredumbre morena" de los durazneros y ciruelos en el Delta del Paraná** [Brown rot of peach and plum in the Paraná Delta], R. FRESA (*Rev. Argentina Agron.*, 12 (1945), No. 1, pp. 22-25, illus. 1; Eng. abs., p. 25).—Brown rot blossom blight of peaches and plums is reported to be serious in this area; the cause was identified as *Sclerotinia fructicola*. Inoculations caused infection of blossoms and fruits but failed to induce definite cankers in the twigs. *S. laxa* was not found.

**Inoculations of the evergreen species of Prunus (Laurocerasus)** with *Tranzschelia pruni-spinosae*, C. O. SMITH. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 35 (1945), No. 7, pp. 572-574, illus. 1).—Of several evergreen species inoculated with urediospores, *P. caroliniana*, *P. ilicifolia*, and *P. ilicifolia integrifolia* gave positive responses. The spots on *P. caroliniana*—2-3 mm. in diameter—had dark brown centers surrounded by a lighter zone; the infected tissue of some fell out leaving a shot-hole effect. The spots on *P. ilicifolia* formed on the younger leaves, with some falling out of the tissue. Fruiting of the fungus was sparse on

the two inoculated hosts; it seems apparent in both that the urediospores of the fungus must come from a more susceptible species and that it could not perpetuate itself on these hosts. *P. caroliniana* has been naturally infected when grown near other infected Pruni. Spontaneous infection on *P. ilicifolia* has yet to be observed.

**Control of spur blight of red raspberries.** R. F. SUIT (*New York State Sta. Bul.* 710 (1945), pp. 14, illus. 2).—Spur blight (*Didymella applanata*) at times causes severe losses in many plantings of New York State. The investigations reported were conducted during 1938-44. Three years' data showed the varieties Indian Summer and Taylor to be very susceptible; Newburgh, Latham, and Milton moderately susceptible; and Ontario, Viking, Cuthbert, Marcy, and Chief slightly susceptible. In the early tests, bordeaux (6-10-100) and Cuprocide 54 (2-100), applied when the new shoots were 10-12 in. high and again 2 weeks later, gave some control. Laboratory tests indicated that 1 percent Elgetol would kill the perithecia on diseased canes; in field tests, 1 percent Elgetol proved superior to 0.5 percent Elgetol, 1 percent Elgetol 312, and lime-sulfur (1-8) for controlling spur blight when applied to the canes in the green-tip stage. Elgetol was more effective when used on Newburgh, Latham, and Chief than on Indian Summer; it gave the best results when applied at the time the buds showed about 0.5 in. of green tissue as compared with applications at the dormant or breaking-bud stages; no injury resulted when the buds showed as much as 1 in. of green tissue. In some years, cover sprays of bordeaux or Cuprocide applied to the new shoots following the green-tip application of Elgetol gave increased disease control over that from Elgetol alone. Fermate (2-100) gave excellent control on the Indian Summer variety with one or two applications and was much superior to any of the other spray treatments tested. U. S. R. No. 604 (1-100 and 0.5-100) and Dithane (1-100) gave excellent control but were not available except for experimental work. The findings show that if Fermate cannot be obtained the next best treatment is a green-tip application of 1 percent Elgetol, followed by an application of bordeaux (3-3-100) when the new shoots are about 10-12 in. high.

**A ganoderma root rot of citrus.** F. W. BLACKFORD (*Queensland Jour. Agr. Sci.*, 1 (1944), No. 4, pp. 77-81, illus. 3).—A root rot found affecting citrus trees in the orchard, as well as species of *Eucalyptus*, was identified as *Ganoderma lucidum*. The fungus and the symptoms induced are described.

**Notas fitopatológicas: Estudio etiológico de la "podredumbre de las raízillas" o "tristeza" de los citros [Phytopathological notes: An etiological study of rootlet rot or tristeza of citrus].** J. C. BERTELLI and L. K. DE BERTILLI (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 17 (1945), No. 1, pp. 15-32, illus. 26; Eng. abs., p. 23).—During the authors' studies of the tristeza disease of citrus they have observed a nematode, *Tylenchulus semipenetrans*, parasitizing the rootlets; a fungus *Lasiostiplodia* sp., as a wound parasite of woody tissues at the juncture of sweet orange grafts on sour orange stock of trees low in vigor; and a systematic virus said to be latent in sweet and sour orange trees but to become pathogenic for the combination of the two in grafting the sweet orange on sour orange stock.

**Technique for hastening foliage symptoms of psorosis of citrus.** J. M. WALLACE. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 35 (1945), No. 7, pp. 535-541, illus. 2).—Inoculations of sweet-orange seedlings—5 to 8 mm. in diameter—via rectangular bark patches taken from psorosis-affected trees gave high percentages of infection, commonly inducing foliage symptoms within 3 weeks. Inoculated seedlings were topped 1 in. above the bark patch, which was placed under a strip partially peeled from the tree to be inoculated and then folded back over the inserted bark patch. New growth developed rapidly and exhibited the psorosis symptoms early; these were either the typical leaf flecking or stippling, or a more severe "shock" reaction with bending, defoliation, and dieback of the new shoots.

This technic should prove useful in fundamental studies of this group of virus diseases; it also provides a simplified test for the presence of virus in parent budwood trees selected for propagation of certified psorosis-free nursery stock.

**Compounds for control of orange decays**, J. F. L. CHILDS and E. A. SIEGLER. (U. S. D. A.). (*Science*, 102 (1945), No. 2638, p. 68).—Of 25 materials recently tested, thiocacetamide, 8-hydroxy-quinoline sulfate, and 2-aminothiazole gave good to excellent control of the stem-end rot and green and blue mold fungi. It appeared that the presence of both an amino group and sulfur is essential for fungicidal activity in these compounds. They may also require toxicity investigation before acceptance for use in treating fruits.

**Navel orange peel oil and water spot**, E. T. BARTHOLOMEW and W. B. SINCLAIR. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 25 (1945), No. 7, pp. 6-7).—It is concluded from experimental data presented that oil sprays do not appear to make navel oranges susceptible to water spot by changing the amount of oil in their peel, that in spite of the fact that the oil content is least in the districts where water spot is most prevalent susceptibility does not appear to depend on the amount of oil in the peel, and that a surprisingly large proportion of the oil remains in the water spot areas of the peel for at least several days after they have become shrunken and brown.

**A root rot of guayule caused by Pythium ultimum**, W. A. CAMPBELL and B. SLEETH. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 8, pp. 636-639, illus. 1).—*P. ultimum* was determined as the cause of this root rot of guayule nursery seedlings in California. Two stages—seedling root rot, affecting plants in the cotyledon stage, and "pink rot," affecting plants 6 to 16 weeks old—are described. The over-all nursery losses were not serious, but occasionally there was considerable mortality in localized areas and especially on heavy poorly drained soil. Of the 51 isolates, 27 produced oospores in culture and were considered typical *P. ultimum*; 24 of the isolates produced only sporangia or sporangialike structures in culture, but were referred to this fungus on the basis of association with oospore-producing isolates, morphological appearance, and growth rates.

**Nematode infection of Croft Easter lilies**, W. D. COURTNEY. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 7, p. 572).—The bud and leaf nematode *Aphelenchooides oleisistus* was established as the cause of dieback in Croft Easter lily plants, infection being characterized by strongly undercurled leaves which become bronzy and later turn brown and die. Examination also showed infections to be carried in the propagation stock.

**Understocks and black-spot**, E. W. LYLE. (Tex. Expt. Sta.). (*Amer. Rose Ann.*, 1944, pp. 160-162).—Four rose understocks—Welch Multiflora, Tate Multiflora, *Rosa manetti*, and Texas Wax—were compared in their effect on the occurrence of black spot and the growth of bushes; all were budded with the Caledonia variety, known to be very susceptible. Early development showed that those propagated on Welch Multiflora had significantly the least black spot, while those on *R. manetti* had the most; as the season progressed the disease spread to infect all quite uniformly. When the bushes were harvested the greatest number and best grade of bushes were those grown on the multiflora understocks, with those on *R. manetti* and Texas Wax the least. Notable improvement in bushes was obtained in adjacent plots where a fungicide was used to combat black spot.

**Studies in the fusarium damping-off of conifers.—III, Relation of temperature and sunlight to the pathogenicity of Fusarium**, H. TINT (*Phytopathology*, 35 (1945), No. 7, pp. 498-510, illus. 8).—In further studies (E. S. R., 93, p. 454), the relation of temperature variations to damping-off and to the growth of host and pathogen was tested in the control equipment described, in which several temperature levels were simultaneously maintained, each fluctuating within its level to

resemble normal diurnal variation. At 10.4°–31.5° C., emergence of *Pinus resinosa* was reduced lethally by higher temperatures, and its rate was reduced by the lower levels. In postemergence development, higher temperatures were associated with more rapid and succulent growth of the seedlings. Optimum growth of *F. oxyphorum* was obtained at about 25°. Increase in losses by damping-off was directly correlated with increasing temperature, but these were relatively negligible at an average temperature of 10°, regardless of size of inoculum. This suggested a critical temperature below which this host could develop and escape infection by *F. oxyphorum*, an organism otherwise causing severe losses. Damping-off losses of *P. resinosa* and *P. sylvestris* were in direct relation to decreasing light intensities, maximum stands being obtained in full light. Losses were correlated with the increase in succulence of the hosts and in the growth of three Fusaria used in the tests, at decreasing light intensities.

*Polyporus versicolor* on Asiatic chestnut, R. R. HIRT and J. L. LOWE (*Phytopathology*, 35 (1945), No. 7, pp. 574–575, illus. 1).—The fungus was found causing typical heartrot. The susceptibility of this host is of practical interest to tree experts and plant pathologists.

The control of fungi in lumber during air-seasoning, A. F. VERRALL. (U. S. D. A.). (*Bot. Rev.*, 11 (1945), No. 7, pp. 398–415).—The control of mold, stain, and decay fungi in lumber during air seasoning has become progressively more important as amounts of the more susceptible sapwood increase with the passing of virgin timber stands and as consumer demands become more critical. This control is best accomplished by chemical dips in conjunction with practices that prevent deep-seated log infections, permit quick chemical treatment after sawing into lumber, and promote rapid drying in the seasoning yard. This comprehensive review (91 references) considers the general aspects of chemical control, influence of fungus floras, chemical mixtures, effect of season of timber felling on resistance to fungus attack, and some necessary adjuncts to chemical control.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

The ecological relationships of the food of the Columbian black-tailed deer (*Odocoileus hemionus columbianus* (Richardson)) in the coast forest region of southern Vancouver Island, British Columbia, I. M. COWAN (*Ecol. Monog.*, 15 (1945), No. 2, pp. 109–139, illus. 19).—Of the three wet and five dry ground associates examined, the deciduous pioneer and the coniferous pioneer forests proved the most desirable habitats for deer. Where no domestic livestock are present these two communities can, under optimum conditions, support deer populations of 20 to 30 per square mile. The new burn community and coniferous subclimax forest, both extensive in area, can each support small deer populations. In British Columbia the coast deer is primarily an inhabitant of pioneer forest communities; removal of either a climax forest or a subclimax Douglas fir forest improves the environment for it. Thus logging is directly responsible for producing improved conditions for this species. Where fire is the deforesting agent or succeeds deforestation, the deer-carrying capacity is not immediately increased but improves gradually to an optimum at about 10 to 15 yr. A program under which clean logging of blocks of land about a square mile in area is practiced, with unlogged blocks left between, can be expected to produce near optimum conditions for coast deer. Where habitat improvement is the aim, the highly palatable forage species should be encouraged; for winter food one of the most important is the Douglas fir. Where desirable to establish escape coverts for upland game birds or lesser wildlife in areas supporting a heavy deer population, such spiny shrubs as roses and gooseberries or unpalatable species such as manzanita, evergreen huckleberry, or broom should be used. When

conifer plantings for ornamental or other purposes are desired on areas subject to deer browsing, jack pine, western white pine, western hemlock, Rocky Mountain juniper, and Oregon yew will prove of minimum attraction to the deer.

It has been found that deer can occasion serious damage to second growth Douglas fir regenerating on deforested areas; current reforestation practice with seedlings planted at about 1,200 per acre provides conditions under which maximum damage can be expected; where seeding gave rise to over 12,000 seedlings per acre, the damage was found to be unimportant. If reforestation of a good site occurs within a year or two after logging and burning of a mature fir forest, and on an area of sufficient size to be beyond the normal cruising radius of a deer from good cover, the trees are usually beyond their reach before the population reaches destructive levels. Cedar was the only browse species found with a palatability as great as that of Douglas fir, but its ecological requirements alone render it of little use as a buffer. Much of the logging industry of the Northwest has been built around the Douglas fir; as stands of this tree become depleted, however, the western hemlock is coming into increasing favor as a timber tree. This hemlock is not eaten by deer and offers a useful species for reforesting suitable sites where deer damage to firs might render that species impracticable. Detailed results of the study are presented.

A partial history of the elk herds of Colorado, L. W. SWIFT. (U. S. D. A.). (*Jour. Mammal.*, 26 (1945), No. 2, pp. 114-119).—The information presented illustrates the ability of this big-game species to become reestablished where range is available and protective measures are applied, shows that elk populations can be increased readily under a restoration program, and thus allays concern over the possibility of overshooting under present limitations of seasons, bag limits, and other restrictive measures. The further application of management principles can be expected to keep the herds in adjustment with their environment.

Some mammals of Ozark County, Missouri, A. S. LEOPOLD and E. R. HALL (*Jour. Mammal.*, 26 (1945), No. 2, pp. 142-145).—An annotated listing.

Physiological studies on hibernation in the chipmunk, A. E. WOODWARD and J. M. CONDRIN (*Physiol. Zool.*, 18 (1945), No. 2, pp. 162-167, illus. 1).—In the eastern chipmunk (*Tamias striatus lysteri*) the erythrocyte count was higher in summer than in winter; there was no indication of seasonal change in leucocyte counts. Weights of the adrenal glands increased nearly threefold from a January low to a plateau during April-September, then regressed. Blood sugar increased 80 percent during January-July in animals kept at about 20° C. the year round. In most animals tested the blood sugar—even in midsummer—would drop markedly when they were kept 24 to 48 hr. at 4°-6°. When, as a result of chilling, the blood sugar fell below 100 mg./100 cc., the chipmunks were likely to become torpid.

Food habits of the golden hamster, D. L. JACOBS. (Univ. Minn.). (*Jour. Mammal.*, 26 (1945), No. 2, p. 199).—A note.

Notes on the life-history of the little short-tailed shrew, W. B. DAVIS and L. JOERIS. (Tex. A. and M. Col.). (*Jour. Mammal.*, 26 (1945), No. 2, pp. 136-138).

The winter habits of the northern white-footed mouse, H. P. THOMSEN. (Univ. Wis.). (*Jour. Mammal.*, 26 (1945), No. 2, pp. 138-142).—In the area studied, white-footed mice lived in groups of 6, 5, 4, 4, and 3 during the winter months of 1943-44. Females predominated in all but one group. Individuals of these groups did not range farther than 30 ft. from their places of shelter and were never caught near the shelter of another group. Caged mice of one group did not tolerate mice from another group. The captive mice huddled together in a definite pattern. This pattern is probably based on social dominance. Ingress of two males occurred 42 days after the removal of a mouse unit.

Parasites collected from wood mouse in West Virginia, L. W. WILSON (*Jour. Mammal.*, 26 (1945), No. 2, p. 200).—Brief notes on insect, arachnid, and nematode parasites.

Controlling rats and house mice, D. W. HAYNE, M. D. PIRNIE, and C. H. JEFFERSON (*Michigan Sta. Cir.* 167, rev. (1945), pp. 40, illus. 26).—The main sections of this enlarged revision (E. S. R., 80, p. 650) present informative material on rats and mice, their practical control, and rat-proofing the farmstead.

Fortified red squill—an efficient rodenticide, L. R. PARKINSON. (Mass. State Col.). (*Soap and Sanit. Chem.*, 21 (1945), No. 7, pp. 115, 119).—It is pointed out that the fortified red squill now available to the trade is well adapted to the needs of pest control operators as well as potential manufacturers of squill baits.

The bird population of an elm-maple forest with special reference to aspec-  
tion, territorialism, and coactions, A. C. TWOMEY. (Univ. Ill.). (*Ecol. Monog.*, 15 (1945), No. 2, pp. 173–205, illus. 12).—Birds of the elm-maple associates were characterized by continuous fluctuations in numbers throughout the various aspects of the community; the spring and fall peaks corresponded with the two main insect peaks, these maxima being reached during 1934–35 when the average mean daily temperature was 59°–61° F. Local movements of the birds in the community from forest to forest edge were in part due to changes in weather, such as prevailing winds and temperatures. These local movements were most pronounced during winter, when cold west or southwest winds drove the birds to the eastern forest edge for protection. On the other hand, the appearance of insects on the ground during warm periods stimulated variable movements in the bird populations. In summer the nesting population was comparatively stable; it was marked by territorial coactions—competition for suitable mates, nest building, and territorial space within the community for the care and feeding of the young as well as for the adults. The methods of censusing were on the quantitative basis, and the results—other than for the breeding season—are relative in character. There were vertical limitations of territories to layer societies of shrubs, trees, etc., as well as horizontal limitations within a layer society. There is a limitation as to available sites within a layer society, depending on the structural adaptation of the species and the physical habitat. The climax association had few nesting species, the major nesting population being confined to the developmental communities. The population density for the nesting species was 0.74 acre per pair in 1934 and 0.79 in 1935. The coactive activity within the community changed with the seasonal aspects; the most abundant insect and plant foods of each aspect were selected by the birds. There was a reversal of the food nexes of the summer and winter periods. The bird population is an important influent element, varying its effects on the community in accord with seasonal phenomena. There are 45 references.

Community selection by birds on the Helderberg Plateau of New York, S. C. KENDEIGH. (Univ. Ill.). (*Auk*, 62 (1945), No. 3, pp. 418–436, illus. 1).—Community selection of shrubby fields or forests rather than grasslands was found correlated with the use of elevated positions for song posts, nest sites, or feeding areas. Selection of forests rather than shrubby fields or grasslands was correlated with the avoidance of high light intensity and with a greater restriction of free movement. Preference for either evergreen or deciduous forest was associated primarily with the size and shape of the leaves and their arrangement on the twigs rather than with differences in persistence of the foliage, in food supply, or in microclimate. This preference was effected in different species through choice of material used in nest building, in choice of nest site, or in manner of feeding. The avoidance or reduction of interspecific competition is an important factor in the evolutionary development of a preference for a particular niche. Behavior patterns stabilize through succeeding generations the local segregation of species into different communities and their positions within these communities. There are 32 references.

The distribution of the birds of California, J. GRINNELL and A. H. MILLER (*Berkeley, Calif.: Cooper Ornithol. Club, 1944, pp. 608, illus. 58*).—A systematic list of species and subspecies is followed by accounts of the native birds of California, including for each the synonymy, geographic range, and habitat. An index to bird names is given.

The birds of Rocky Mountain National Park, Colorado, F. M. PACKARD (*Auk*, 62 (1945), No. 3, pp. 371-394).—A copiously annotated check list (30 references), including information on the occurrence, relative abundance, and habits of birds in this national park and vicinity.

The birds of the Cariboo Parklands, British Columbia, J. A. MUNRO (*Canad. Jour. Res.*, 23 (1945), No. 3, Sect. D, pp. 17-103, illus. 26).—This is an ecological study of an area in which the principal physiographical features are composite forests of lodgepole pine and aspen, grasslands, and shallow valleys containing many lakes, ponds, and marshes of various types. "Ten vertebrate habitats, each with a characteristic biota, are recognized. The region is an important migration route for waterfowl and constitutes the principal, and for some species the most northerly, nesting ground in the province. Nesting grounds are in units that vary greatly in size, in type of cover, and in their food potentials. They are subject to contraction in space, and consequent reduction in productivity, because of periodic seasons of drought. The biota is in rapid process of modification as a result of various human activities. Agricultural developments permanently impaired waterfowl habitat in some places but in other places, where the outlets of ponds have been dammed in order to store water for irrigation purposes, nesting grounds have been improved. The summer land bird population is derived mainly from the south, and it includes several species that here reach the northern periphery of their range. The population also contains species of eastern origin that are not known to nest further south in the province. A total of 212 species and subspecies of birds are recorded for the region. Observations of the life history and behaviour of certain species are presented in detail."

Corn injury by red-wings in Michigan, H. A. CARDINELL and D. W. HAYNE (*Michigan Sta. Tech. Bul.* 198 (1945), pp. 59, illus. 32).—Data are presented relative to red wing (*Agelaius phoeniceus phoeniceus*) damage to field corn in 30 protected and unprotected fields. Acetylene exploders were found to supply efficient protection. Rags hung in the corn rows also showed promise as a cheap and easy form of protection although possibly only temporary. Both exploders and rags may require a few days' operation before becoming established at the most efficient level of protection. Corn will probably gain in yield if matured properly before harvesting, even if the birds are attacking it.

The invasion of the starling into Iowa, P. A. DU MONT (*Iowa Bird Life*, 15 (1945), No. 2, pp. 30-33, illus. 1).—The progressive invasion of the European starling into all parts of Iowa since first reported in December 1922 has been recorded with such completeness that it has been possible to tabulate its first appearances in each of the 99 counties of the State, as here presented with accompanying map.

Twentieth supplement to the American Ornithologists' Union Check-List of North American Birds, A. WETMORE ET AL. (*Auk*, 62 (1945), No. 3, pp. 436-449).—See also previous lists (E. S. R., 92, p. 77).

Raising crickets for bait, H. S. SWINGLE (*Alabama Sta. Leaflet* 22 (1945), pp. [4], illus. 4).—Crickets are said to be one of the most effective baits for bream during late summer and fall. This leaflet presents information on the life cycle of the field cricket and on methods of rearing it in quantity for this purpose.

A list of spiders collected near Memphis, Tennessee, W. W. GIBSON (*Jour. Tenn. Acad. Sci.*, 20 (1945), No. 2, pp. 214-217).

[Notes on insects and insecticides] (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 274-283, illus. 1).—Contributions presented (E. S. R., 93, p. 166) are DDT To Control *Glossonotus craiaegei*, by E. H. Wheeler (p. 274) (N. Y. State Expt. Sta.); Toxicity of DDT to Fish, by J. M. Ginsburg (pp. 274-275) (N. J. Stas.); DDT To Control the Cotton Leafworm, by E. E. Ivy and K. P. Ewing (p. 276) (U. S. D. A. coop. Tex. Sta.); DDT To Control *Psallus ancorifer* in Onions, by B. G. Thompson (p. 277) (Oreg. Sta.); Residual Action of DDT Aerosols Against Houseflies, by H. O. Schroeder, A. H. Madden, H. G. Wilson, and A. W. Lindquist (pp. 277-278) (U. S. D. A.); DDT for the Control of Grape Leafhoppers [*Erythroneura* spp.], by J. A. Cox (pp. 278-279) (Pa. Sta.); DDT in the Codling Moth Program for Western New York, by S. W. Harman (pp. 280-281), and DDT and Ryanex To Control Oriental Fruit Moth on Quince, by E. H. Wheeler (pp. 281-282) (both N. Y. State Sta.); Experiments with DDT on Leaf-Cutting Ants [*Atta cephalotes* (L.)] in Ecuador, by E. J. Hambleton (p. 282), and DDT To Control the Chinch Bug, by P. Luginbill and C. Benton (p. 283) (both U. S. D. A.); and DDT To Control the Carrot Rust Fly, by H. E. Morrison, D. C. Mote, and W. B. Rasmussen (p. 283) (Oreg. Sta.).

Insect food habit ratios of the Lloyd-Cornell Reservation, H. B. WEISS (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 2, pp. 167-168).—A report of a survey of the insect feeding habit ratios in this 81-acre reservation near Ithaca, N. Y., with those for the State as a whole.

Insect response to colors, H. B. WEISS (*Sci. Mo.*, 61 (1945), No. 1, pp. 51-56).—A general review and discussion of present knowledge of the subject.

Lucha contra insectos en los Estados Unidos, especialmente con referencia a los agentes biológicos [Control of insects in the United States, with special reference to biological agents], H. L. PARKER. (U. S. D. A.). (*Univ. Repub. [Montevideo], Rev. Facult. Agron.*, No. 38 (1944), pp. 17-107, illus. 96).—An address summarizing the results attained with biological control in the United States, including a brief note on the use of insects in controlling *Opuntia* spp.

The head and mouthparts of the sucking lice (Insecta: Anoplura), C. J. STOJANOVICH, JR. (*Microctomology*, 10 (1945), No. 1, pp. 46, illus. 26).—A study undertaken to establish the anatomical facts concerning the head and mouth parts of the group and then, by application of certain principles, to attempt to homologize these structures with those found in other insects.

. Undescribed species of crane-flies from the western United States and Canada (Dipt.: *Tipulidae*), I-IV, C. P. ALEXANDER. (Mass. State Col.). (*Ent. News*, 54 (1943), Nos. 2, pp. 45-51; 10, pp. 253-258; 56 (1945), Nos. 5, pp. 126-132; 6, pp. 155-161).—New species of *Erioptera*, *Ormosia*, and *Molophilus* are described in part 1, *Limonia*, *Rhabdomastix*, and *Cryptolabis* in part 2, *Tipula* in part 3, and of *Limonia*, *Erioptera*, *Ormosia*, and *Molophilus* in part 4.

Estudo sobre Flebotomus no Vale Amazonico.—Parte I, Descrição de *F. marajoensis*, *F. pilosus*, *F. souzastroi* e *F. christophersoni* (Diptera: Psychodidae) [Study of Phlebotomus in the Amazon Valley, I], R. G. DAMASCENO and O. R. CAUSEY (*Mem. Inst. Oswaldo Cruz*, 41 (1944), No. 2, pp. 339-350, illus. 25).—The above four new species of sand flies are described and illustrated.

The relative food-consumption of diamond-back moth and white butterfly larvae, B. B. GIVEN (*New Zeal. Jour. Sci. and Technol.*, 26 (1944), No. 4, Sect. A, pp. 195-197, illus. 3).—The volume of cabbage leaf consumed by larvae of the diamondback moth and the imported cabbageworm was measured and compared as both a daily and a total quantity. It is pointed out that the true relative damage index of equal populations will be in the ratio of the daily food intake over the entire life cycle from oviposition to oviposition of the progeny; this index has been worked out.

**Longevity of diamond-back moth (*Plutella maculipennis*) adults in relation to nutrition, B. B. GIVEN** (*New Zeal. Jour. Sci. and Technol.*, 26 (1944), No. 4, Sect. A, pp. 192-194, illus. 2).—Experimental data given are believed to indicate the ability of adults to survive long periods of adverse conditions. The necessity for suitable food is apparent, and food stored in the body as a result of feeding for a short period appears to be negligible, since feeding for 1 day prolongs life very slightly more than not feeding at all. Fertility appears to be fairly high with either honey solution or that plus pollen.

**Notes on the physical ecology of *Diadromus (Thyraeella) collaris* Grav., B. B. GIVEN** (*New Zeal. Jour. Sci. and Technol.*, 26 (1944), No. 4, Sect. A, pp. 198-201, illus. 2).—*D. collaris* was introduced into New Zealand as a pupal parasite of the diamondback moth; brief data are presented on its reactions to temperature and humidity.

**A supplement to the New York State list of Coleoptera, No. 6, additions and corrections, B. MALKIN** (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 2, pp. 91-116).—An annotated list, with an eight-page bibliography (E. S. R., 58, p. 754).

**The influence of temperature on the development of the different stages of *Calandra oryzae* L. and *Rhizopertha dominica* Fab. (Coleoptera), L. C. BIRCH** (*Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 1, pp. 29-35, illus. 3).—The temperatures below and above which full development from egg to adult failed to occur in grain of 14-percent moisture content were 15.2° and 34° C. for the rice weevil and 18.2° and 39° for the lesser grain borer; most of the kill at unfavorable temperatures occurred in the first larval instar. The rice weevil developed from egg to adult in the shortest time at 29.1°; the lesser grain borer, at 34°. The corresponding temperatures for the egg stages were higher than for the larvae. There was no significant difference in the developmental rates of the two sexes. Within the temperature range of the lesser grain borer, 35.5 percent occurred above the temperature at which development was fastest (34°); the figure for the rice weevil was 16.5 percent. At any particular temperature, all stages of the lesser grain borer took longer to develop than those of the rice weevil, except at 32.3° (the highest temperature at which the latter developed without high mortality), when both species took about the same time to develop from egg to adult. The developmental rate of the rice weevil was slower at a density of three individuals per grain than with only one; development was also slower in wheat drier than 14-percent moisture content.

**A new species of *Oberea* from Canada (Coleoptera: Cerambycidae), W. S. FISHER.** (U. S. D. A.). (*Canad. Ent.*, 77 (1945), No. 3, p. 56).

**Activity of blister beetle triangulins, N. P. LARSON.** (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc.*, 23 (1943), pp. 31-32).—Field studies are said to indicate that for at least three species—*Macrobasis segmentata* (Say), *M. murina* (Lec.), and the spotted blister beetle—the activity of triangulins (first instars) consists of crawling on the ground surface and in and out of cracks and holes in search of food, rather than through the soil.

**Three new species of *Laminitarsus* Fullaway from Singapore and the Philippines (Hymenoptera: Braconidae), Y.-T. MAO.** (Univ. Calif.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 6, pp. 189-192, illus. 12).

**The wax of stingless bees (Meliponidae) and the uses to which it has been put, H. F. SCHWARZ** (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 2, pp. 137-144).—A review (40 footnote references) of the uses at various times and places.

**Sorption of fumigants, O. F. LUBATTI** (*Nature [London]*, 155 (1945), No. 3941, p. 577).—A brief review and preliminary account of experiments on the mechanism of sorption of organic vapors used as fumigants on wheat.

**New sprayer for testing aerosols, G. H. BATT** (*Soap and Sanit. Chem.*, 21 (1945), No. 7, pp. 117, 119, illus. 2).—For reliable results it is essential to measure

accurately the quantity sprayed, to atomize it efficiently, and to keep the concentration of the mixture constant. The sprayer described and illustrated is said to accomplish all these features with greater ease than other sprayers examined.

**Concentrated insecticides:** Preliminary studies of the use of concentrated sprays against houseflies and mosquitoes, A. W. LINDQUIST, H. O. SCHROEDER, and E. F. KNIPLING. (U. S. D. A.). (*Soap and Sawit. Chem.*, 21 (1945), No. 7, pp. 109, 111, 113, 119).—Data are presented indicating that sprays containing DDT or pyrethrum or a combination of the two—when dispersed in finely atomized form—will give as good a knock-down and kill of houseflies and mosquitoes in concentrated as in dilute solutions, provided the amount of active ingredients is the same. A practical formula contains 20 percent of DDT plus 2-3 percent of pyrethrins plus an auxiliary solvent in kerosene. Fine-mist sprays compared favorably with liquefied-gas aerosols when tested on a biological basis. Houseflies exposed for 5 min. as long as 30 min. after discharge of either an aerosol or a spray showed high mortality. A Freon aerosol and a concentrated spray dispersed in a pocket-sized capillary-tube sprayer at sublethal dosages were equally effective on the basis of 24-hr. mortality, though the aerosol caused a somewhat faster knock-down. Equipment for dispersing these sprays has been designed, and models of pocket-size sprayers have been built which show much promise; they weigh considerably less than a 1-lb. aerosol container or the usual type of household sprayer.

**DDT insecticides developed for use by the armed forces,** E. F. KNIPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 205-207).—A brief statement on the testing of DDT insecticides for control of certain insects and arachnids affecting the health of members of the armed forces, as well as civilians, with references to cooperating agencies.

**DDT insecticidal preparations,** H. A. JONES, H. T. FLUNO, and A. B. HENDRICK. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 207-210).—The authors describe various insecticidal preparations of DDT developed for control of insects affecting man. The most widely used DDT dusts are the louse powder and the mosquito-larvicide dust. DDT is difficult to grind alone but may be readily ground with an inert diluent. Its solutions are widely used, and the solubility in several solvents is presented. Petroleum oil solutions can be used extensively as mosquito larvicides and as residual sprays. Emulsions are perhaps the most versatile types of preparation. A suitable emulsion concentrate has been developed that meets the many requirements for controlling insects affecting man; it can be used as a mosquito larvicide, a residual spray, and for louseproofing under-wear and other insecticidal purposes. Mechanical suspensions of DDT have some use as residual sprays, and colloidal suspensions have been found effective when employed experimentally as larvicides.

**DDT as an automatic killing agent in Japanese beetle traps,** G. S. LANGFORD, M. H. MUMA, and E. N. CORY. (Univ. Md.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 199-201, illus. 3).—During the past season several traps were designed and field tested—using DDT as a killing agent—that would not need emptying out of the killed beetles. The results indicated DDT in either liquid or solid media to be effective, consistent kills of 100 percent being obtained in several tests. A satisfactory liquid medium may be prepared by mixing a saturated solution of xylene and DDT, one part, with one part each of debase oil and light white mineral oil. A modified bait bottle equipped with a wick arranged to provide a contacting surface of about 1 in. diameter proved efficient for dispensing the liquid and killing the beetles; the average kill with this equipment for 18 observations was 98.4 percent.

**DDT to control Japanese beetles on fruit,** G. S. LANGFORD and E. N. CORY. (Md. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 202-204).—In the 1944 tests on fruit and foliage of peach, apple, plum, cherry, and grape, DDT had good

repellent qualities, proved decidedly toxic to the beetles as a contact spray, and the dried residue was highly lethal. In water suspensions it appeared compatible with sulfur, bordeaux, and lime-sulfur and was not injurious to plants on which these fungicides can be safely used. On the basis of toxicity of dried residue, a water suspension applied as a coarse spray without wetting agent was more effective than an emulsion; the latter was more desirable on ripening fruit, leaving no obvious residue. A 2.5 percent dust was effective against all beetles thoroughly dusted. In comparative tests the water suspension averaged longer periods of protection than the ethylene dichloride emulsion. In general, at least 75-percent control of grape foliage damage may be expected from one spray on some varieties; others may require two applications. With peaches, a treatment 8 to 10 days before ripening in most cases carried the fruit through harvest without damage from beetles, fruit on the control trees being completely destroyed. In four heavily infested apple orchards, swarms of beetles were largely destroyed and the foliage and ripening fruit protected for the rest of the season by one application.

DDT treatment of airplanes to prevent introduction of noxious insects, A. H. MADDEN, A. W. LINDQUIST, and E. F. KNIPLING. (U. S. D. A. et al.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 252-254).—Experimental laboratory and field investigations indicated that DDT-residue treatments in airplanes provide effective toxicity against mosquitoes and houseflies for at least 6 weeks. Airplanes in operational use were treated with various DDT solutions, an emulsion, and a dust. At intervals, flies and mosquitoes were placed in them to note the length of time for knock-down and kill. As to duration and effectiveness, dust treatments were less satisfactory than sprays, except when applied to upholstered surfaces, and this fact, together with the unsightliness of the deposit, counterbalances the greater ease of applying dusts. The best spray treatments gave a high knock-down of both pests after a 2-hr. exposure; the most satisfactory formula appeared to be a 20 percent DDT applied as a fine-mist spray.

[Turf management:] The control of insects, C. JENNINGS (*Rhode Island Sta. Misc. Pub.* 26 (1945), pp. 12-19).—Suggestions are given for the control of chinch bugs, ants, sod webworms, and grubs of June and Japanese beetles.

Wheat-seeding dates and the hessian fly in Kansas, J. R. HORTON, E. T. JONES, H. H. WALKDEN, and G. A. DEAN. (Coop. U. S. D. A.). (*Kansas Sta. Bul.* 59 (1945), pp. 18, illus. 3).—Data presented show that the hessian fly occurs generally in Kansas, and is numerous enough to be found in limited samplings almost every year in the eastern half of the State. Apparently, however, it becomes abundant only occasionally, in about 1 yr. out of 4 or 5 on the average, and severe injury is even less frequent. Although often occurring in the western fourth of the State, this species seldom rises to threatening numbers. The safe fly date is somewhat earlier than previously recommended, ranging from October 1 in northeastern and southwestern Kansas, or even earlier for northwestern Kansas, to October 10 in the southeastern part of the State. Providing soil and climatic factors are favorable, these planting dates will result in little or no reduction in yields as compared with earlier dates. A table is included showing suggested dates for central and eastern Kansas. No special attention need be given to safe-seeding dates in western Kansas in years when the hessian fly is scarce, but during periods of fly abundance in this area, safe-seeding dates should be followed. It is suggested that a regular summer hessian fly survey should be made annually in order to give growers necessary information on which to adapt seeding practices. Early seeding seems undesirable, and extremely early seeding or disregard of safe dates in fly years will allow development of general infestations which would result in serious losses of wheat.

DDT to control corn flea beetle on sweet corn and potato leafhopper on alfalfa and peanuts, F. W. Poos. (U. S. D. A. coop. Va. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 197-199).—Preliminary small-scale field tests of 1944 are briefly reported upon. Although a practical dosage and schedule of treatments were not determined, it was indicated that the corn flea beetle and to a certain extent the bacterial wilt can be controlled in early sweet corn by use of a DDT spray. Successful control of the potato leafhopper on alfalfa was obtained with low concentrations of DDT as a spray or dust and with a pyrethrum-sulfur dust; the hay crop was also improved by all three insecticides. On peanuts, two applications of a 2-percent DDT dust were more effective in controlling the potato leafhopper than four applications of sulfur dust. Of most significance in the tests against the potato leafhopper was the residual effect of DDT, which seemed to prevent nymphal development almost entirely on alfalfa and potato foliage.

Insects affecting potatoes, J. A. MUNRO, F. G. BUTCHER, and K. REDMAN (North Dakota Sta. Bimo. Bul., 7 (1945), No. 5, p. 25).—A comparison of the relative abundance of potato flea beetles, leafhoppers, and Colorado potato beetles each year from 1940 to 1944.

The control of psyllids and flea beetles on potatoes, W. A. RIEDL and L. R. HARRISON (Wyoming Sta. Bul. 271 (1945), pp. 29, illus. 9).—Several dust mixtures containing sulfur proved efficient for both psyllids and flea beetles. A 90 percent microfine sulfur dust and two 325-mesh sulfur dusts containing 7 percent conditioning agent gave almost equal control of the potato psyllid. Control of psyllids was about the same with applications of 10, 20, and 30 lb. of sulfur dust per acre when the psyllid population was low, but the higher rates gave significantly better control when the psyllid population was high. Application of dust from each side of the row with a canvas hood over the boom resulted in higher yields than applying the dust from each side of the row without a hood, when the psyllid population was high and 20 lb. of dust were applied per acre. Higher yields were obtained by applying the dust from above the row without a hood than applying the dust from each side of the row without a hood. Four different methods of application when the psyllid population was low and the flea beetle population was high, with the rate of application kept constant at 30 lb. per acre, did not result in significant differences in control.

DDT and other new materials for spraying potatoes, J. P. SLEESMAN, H. L. GUI, and J. D. WILSON. (Ohio Expt. Sta.). (*Ohio Veg. and Potato Growers Assoc. Proc.*, 30 (1945), pp. 140-147).—DDT is reported to have given the most outstanding performances of any material recorded for use on potatoes during the past 25 yr.; used alone or in combination with various fungicides, it gave remarkable control of potato leafhopper, exceptional flea beetle control, and significantly higher yields than those secured with any other treatment employed. The influence of DDT on leaf character and vine vigor is also said to have been outstanding. It is deemed probable that its use will bring about important changes in potato spray formulas and practices, but more information on dosages, residual efficiency, spray intervals, etc., must be obtained before it can be used most effectively and efficiently. Methasan gave results comparable to bordeaux. In 1943 tests Dithane gave the highest yield among 26 formulas tried, but poor performance was recorded for 1944, possibly due to an inferior formulation. Fermate spray gave poor leafhopper control and low yields, but better results were obtained through its use as a dust. Addition of calcium arsenate to bordeaux, COC-S, and CAC sprays applied to muck-grown potatoes failed to result in significantly larger yields than from these materials alone, but its use with several fungicides on upland-grown potatoes usually resulted in some increase in yields. DDT combined with various fungicides gave a much larger reduction in adult flea beetle feeding punctures than when combined

with calcium arsenate. A dust made up of COC-S, calcium arsenate, and talc applied so as to cover all foliage completely gave results comparable to bordeaux spray. Among the fixed copper compounds tested over a period of years, the chlorides have proved most effective in controlling potato pests, but in this State they have not been quite as effective as bordeaux.

**DDT to control potato insects**, G. G. GYRISKO, J. F. T. JODKA, and W. A. RAWLINS. (Cornell Univ.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 169-173, illus. 2).—In several trials on Long Island and in western New York, DDT appeared very promising as a supplement in sprays and dusts for control of potato insects, including the Colorado potato beetle, aphids, flea beetles, and leafhoppers; in fact, if further work confirms these findings, DDT may prove superior to the insecticides now in use. One of the outstanding attributes was the very pronounced and prolonged residual effectiveness; insects remained at a low level for 10 days or more after application—this being the maximum time between sprays in the recommended program. On the other hand, no marked tenacity was apparent for the dusts on Long Island, possibly due to the low content of DDT or to an inherent difference between sprays and dusts. DDT proved compatible with bordeaux, the most common fixed coppers, and at least two organics—Fermate and Dithane. Preliminary trials with a number of dust diluents indicated hydrated lime to be the only one which reduced the toxicity. Although DDT was used in concentrations as high as 10 percent in dusts and 5 lb. per 100 gal. in sprays, no plant injury was evident on field-grown potatoes.

**Experiments with aerosols against some pests of truck crops**, F. F. SMITH, L. P. DITTMAN, and L. D. GOODHUE. (Md. Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 189-196).—The toxicity of DDT aerosols was observed in field treatments on 31 species of insects attacking vegetable crops or predators on these insects. Many of the plant pests, including the onion thrips, potato flea beetle, tarnished plant bug, spittle bug (*Philaenus leucophthalmus* (L.)), six-spotted leafhopper, garden webworm, eggplant lacebug, potato aphid, and lepidopterous larvae were found susceptible. Among the resistant species were the harlequin cabbage bug, squash bug, Mexican bean beetle, coccinellid adults and larvae, and syrphid larvae. Aerosols containing nicotine generally gave lower kills or were ineffective, and most of those containing derris resins were ineffective. The heavy DDT aerosols—producing larger droplets—were generally more effective than the lighter ones. Against most insects aerosols containing 5 percent DDT—efficiently applied—were practically as effective as those containing 10 percent. A canopy on the applicator to allow for distribution of the aerosol and prevent wind drift in most cases increased the efficiency. No plant injury occurred except on lima and snap beans treated with DDT aerosols containing high proportions of cyclohexanone.

**DDT in aerosol form to control insects on vegetables**, L. D. GOODHUE, F. R. SMITH, and L. P. DITTMAN. (Md. Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 179-182).—The results of this cooperative investigation are briefly summarized, including greenhouse and field tests and the development of machines for applying the aerosols. The DDT aerosols proved effective against about 25 species of insects attacking vegetable crops in field experiments during 1944. Among the most important pests succumbing were the pea aphid, potato aphid, green peach aphid, *Aphis abbreviata* Patch, onion thrips, Colorado potato beetle, potato flea beetle, garden webworm, eggplant lacebug, potato leafhopper, six-spotted leafhopper, and *Philaenus leucophthalmus* (L.). The practical considerations with respect to this method of application are discussed. The principles involved differ but little from those applying to concentrated sprays. For controlling such pests as the onion thrips, six-spotted leafhopper, eggplant lacebug,

and potato aphid, the method appears to be outstanding. Its success will require the skill and cooperation of manufacturers equipped for handling liquefied gases, a different system of handling will be necessary, and some training in the operation of the aerosol-applying machinery itself.

DDT aerosols to control onion thrips and other pests in greenhouses, F. F. SMITH and L. D. GOODHUE. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 173-179).—An aerosol containing 5 percent each of DDT, cyclohexanone, lubricating oil, and acetone dispensed in dichlorodifluoromethane proved highly toxic to the onion, banded greenhouse, and chrysanthemum thrips; adults of the greenhouse white fly; green peach and corn leaf aphids; American cockroach; housefly; *Rhopalosiphum rufomaculata* (Wilson); *Gryllodes sigillatus* Walk.; *Lycoria inconstans* (Fitch); and sowbugs (*Armadillidium nosatum* B. L.). The material was tested day or night at varying greenhouse temperatures on a wide range of plants without injury to any except cucumber at high dosages and occasionally seedling tomato and soybean; the injury was traceable to cyclohexanone. Single aerosol treatments eliminated thrips infestations on chrysanthemums and soybeans, while two treatments were used on onions and squill. By use of DDT in a heavy aerosol, thrips on onions were destroyed without affecting housefly pollinators caged with the flowers; the treatments resulted in greater seed production and less botrytis rot than in former years.

The Mexican bean beetle, B. B. PEPPER (*New Jersey Stas. Cir.* 495 (1945), pp. 12, illus. 8).—A practical account.

DDT aerosols for pea aphid control, L. P. DITMAN, F. F. SMITH, L. D. GOODHUE, and T. E. BRONSON. (Md. Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 183-188, illus. 1).—In one season's work DDT applied as a liquefied-gas aerosol was highly effective against the pea aphid on alfalfa and on Alaska and wrinkled peas, was rapid in action, and gave a kill of aphids equal or superior to standard sprays of ground derris root or sprays of aqueous suspension of DDT. Aerosols of derris resins gave unfavorable results, while the nicotine aerosols—though giving fair kills—caused injury to alfalfa and pea plants. About 5 percent of DDT appeared to be the optimum concentration for use against the pea aphid, and good results were obtained with several combinations of the solvents cyclohexanone, lubricating oil, and acetone, with 50 percent of methyl chloride as a propellant. DDT aerosol treatments compared favorably in cost with standard treatments and in addition may be applied with simply constructed inexpensive equipment.

DDT sprays to control codling moth in Maryland, C. GRAHAM. (Univ. Md.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 272-273).—It appeared from the tests reported that DDT in all combinations and in all but one of the strengths (0.5 lb. per 100 gal.) tried gave control of codling moth as good as or better than the standard sprays used as checks. Where DDT was used at the rate of 1 lb. or more per 100 gal. of spray the percentage of clean fruit was approximately the same regardless of size of crop; this was not true for the standard schedules.

DDT to control the little fire ant, M. R. OSBURN. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 167-168).—In one series of experiments reported, one treatment of DDT-fuel oil applied at the rate of either 16 or 8 oz. DDT per 100 gal. proved very effective in controlling the little fire ant for a 4-mo. period, and at the end of this time (November 9) there was no indication that trees were becoming reinfested. The banding treatment was less effective than spraying the tree trunks and larger branches with a power sprayer. In a second series of tests of five sprays and a dust—all containing DDT—the most effective was 4 oz. DDT in fuel oil, which was still effective at the date of the latest count, 2 mo. after treatment; the least effective was the dust containing 1 percent DDT. No injury to the grapefruit trees was observed from any of the treatments.

New descriptions of larvae of forest insects: Larvae of the genus *Eupithecia* (Lepidoptera: Geometridae), W. C. McGUFFIN (*Canad. Ent.*, 77 (1945), No. 3, pp. 53-55).—The larvae of two species are described, and additional notes are given on three previously described, along with a key for separating mature larvae of these five species.

Comment on the budworm outbreak in Ontario and Quebec, C. C. HEIMBURGER (*Forestry Chron.*, 21 (1945), No. 2, pp. 114-126).—The author comments on the literature (14 references) and on his observations made during a trip undertaken to study areas of heavy infestations of the spruce budworm in Ontario and Quebec; genetic and ecological considerations receive the major emphasis.

Observations on outbreaks and control of the mountain pine beetle in the lodgepole pine stands of western Canada, G. R. HOPPING and W. G. MATHERS (*Forestry Chron.*, 21 (1945), No. 2, pp. 98-108, illus. 2).—This paper presents the history and probable underlying causes of outbreaks such as the one under study in the stands of lodgepole pine in the Banff National Park in Alberta. On the basis of findings to date, it is considered that control work should be started at the first signs of abnormal increase of the pest. When a considerable area is involved, control work is not apt to succeed if the infestation has reached the point of an average of five green infested trees per acre; at this stage, salvage operations should be instituted. The control area must be geographically isolated from any other source of infestation by a high mountain barrier or by a distance of probably 30 miles or more. Control work must be continued as long as the underlying causes of the infestation are operative—in the area under study, e. g., until a predominantly wet period brings the trees back to normal vigor. In effective control, the object must be to treat every infested tree, and the entire area must be covered; treatment of red as well as green infested trees is desirable and probably necessary. It is advisable to remove all trees showing signs of attack—even those with only one pitch tube. Complete burns are preferable; all trees scorched by fires should be felled and burned and fresh windfalls cleaned up. As long as the character of the stand remains the same, future outbreaks may be expected whenever tree vigor is seriously reduced. The only permanent solution seems to be a change in composition to a mixed stand. The control work in this area has been successful thus far and a major catastrophe has been avoided.

Effect of southern pine beetle on timber losses and natural restocking, C. H. HOFFMANN and R. F. ANDERSON. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 6, pp. 436-439, illus. 1).—Small losses were caused by the southern pine beetle during a 24-yr. period on the watershed studied; pure pine stands proved more susceptible than the mixed pine-hardwood. On limited areas over three-fourths of the pine trees 6 in. d. b. h. or over were attacked and killed; smaller trees were less subject to attack. The openings in stands left by bark beetle attacks failed to revert to pure pine stands but were taken over by mixed pine-hardwoods, the pines present in the mixture being the ones which had not succumbed. Little or no pine reproduction became established after the dying of the larger trees.

Observations on species of Lepidoptera infesting stored products, XIII, XIV (*Entomologist*, 78 (1945), No. 985, pp. 87-88).—A continuation of the series (E. S. R., 90, p. 379; 91, p. 57).

XIII. The identity of *Hyphantrium sericarium* A. W. Scott (Pyralidae), A. S. Corbet and W. H. T. Tams.—*H. sericarium* Scott is reduced to a synonym of *Ephestia elutella* (Hbn.).

XIV. *Leucania zeae* (Dup.) (Agrotidae) and *Setomorpha ruficella* Zeller (Tineidae) found on ships in London docks, A. S. Corbet.

Carpet beetles, J. B. SCHMITT (*New Jersey Stas. Cir.* 496 (1945), pp. 7, illus. 4).—A practical account.

**DDT and other insecticides as residual-type treatments to kill bedbugs**, A. H. MADDEN, A. W. LINDQUIST, and E. F. KNIPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 265-271).—Laboratory tests of a large number of organic compounds—applied both as dusts and as sprays—showed DDT and pyrethrums to be the only satisfactory insecticides among them that were effective against *Cimex* spp. and that at the same time would retain their toxicity for some time after application; DDT proved much superior as to residual toxicity. Of four DDT analogs tested, 5 percent of 2,2-di-*p*-anisyl 1,1,1-trichloroethane gave a high kill up to 39 days. In cages, the sprays containing 20 percent DDT gave complete mortality up to 78 days, whereas pyrethrum spray containing 0.5 percent pyrethrins gave a low kill after 9 days. In later tests the best results were obtained with a 5 percent DDT aqueous suspension—complete mortality after 191 days. An aerosol consisting of 6.5 percent DDT plus 12.5 percent *o*-dichlorobenzene in methyl chloride—applied at 100 mg. DDT per square foot—gave a 100 percent kill for 54 days. In practical tests made in infested houses and barracks, sprays containing 5 to 20 percent DDT remained highly effective 5 to 11 mo. Of the various spray mixtures tested, 5 percent DDT in kerosene is considered most satisfactory for practical reasons; it may be applied as a spray so as to leave a deposit of at least 100 mg. DDT per square foot. Complete kill of bedbugs contacting the deposit may not occur until about 48 hr. after exposure.

**DDT powder for the control of lice attacking man**, R. C. BUSHLAND, L. C. MCALISTER, JR., H. A. JONES, and G. H. CULPEPPER. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 210-217).—In arm-and-leg tests DDT at 0.25 percent caused complete mortality of body lice in 24 hr. but had little lasting qualities; powders containing 1 percent usually gave complete kill for 8 to 10 days; a 5 percent powder was effective 14 to 16 days; and arm-and-leg sleeves treated with a 10 percent powder generally gave complete kill for 30 to 40 days. In tests on grossly infected subjects a 10 percent DDT powder gave practically complete kill of lice for 3 weeks. All the lice exposed to a 10 percent powder were knocked down in 6 hr. and were dead in 20 hr.; exposure for 3.5 hr. prevented hungry lice from feeding, and those starved for several hours were more susceptible to DDT than freshly fed lice. DDT mixed mechanically with powder diluents proved as effective as those prepared by the solvent-mix method; pyrophyllite and certain grades of talc were the most suitable diluents tried. Within the range of sizes tested (6 $\mu$ -17 $\mu$ ), particle size of DDT did not appreciably influence the effectiveness of the louse powder; dusts made with pyrophyllite diluent of particle sizes of 5 $\mu$  or less were more effective than those made with diluent of larger particle sizes. A powder containing 10 percent of DDT did not lose its effectiveness after several months' exposure to the open air or when stored at 60° C. for 2 mo., but after 10 mo. lost about half its toxicity. Garments dusted with DDT remained effective against lice after one washing but not after two washings in warm soap and water. Of more than 100 compounds tested with DDT, none showed marked synergistic action. The 10 percent DDT powder was found highly effective against crab lice in the more than 100 cases treated.

**DDT impregnation of underwear for control of body lice**, H. A. JONES, L. C. MCALISTER, JR., R. C. BUSHLAND, and E. F. KNIPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 217-223, illus. 1).—In arm-and-leg tests, garments treated with 0.05 percent DDT in solution were effective for more than a week's wearing; those impregnated with 0.5 percent solutions, after 3 washings; and those treated with 1 percent, after 4 washings. The duration of effectiveness was, in general, about the same from solutions and emulsions. Treated arm-and-leg garments showed no decrease in effectiveness after storage for a year. Whole two-piece suits of 50 percent wool underwear dosed with 10 gm. DDT remained highly effective after 5 washings, and suits receiving 20 gm. underwent 9 or 10 washings

with successful results. A dosage of 15 gm. (2 percent of the weight of the garment) is recommended as good for 6 to 8 washings. Practical methods for impregnation with DDT were developed. A portable outfit using a 30-gal. water-sterilizing bag was found entirely feasible, one filling being sufficient to impregnate 124 suits—186 lb.—of part-wool underwear; a large-scale treatment was made in standard laundry equipment. Suits treated with an emulsion giving a dosage of 2 percent of the weight of the garment gave protection through 6 to 8 washings, and an unwashed suit was still killing all introduced lice after 6 mo. of wearing. It is suggested that if the method is to be used in the United States volatile solvent solutions be used in dry-cleaning equipment; for louseproofing overseas, an emulsion is recommended.

**Effectiveness of DDT against flies in livestock barns,** J. A. MUNRO, K. REDMAN, and J. H. LONGWELL (*North Dakota Sta. Bim. Bul.*, 7 (1945), No. 5, pp. 21-23, illus. 2).—Detailed observations were made on the effect of DDT used as a spray or dust in dairy and hog barns. Results indicated that the outstanding advantage of DDT for use in livestock barns appears to be its convenience of application and lethal action on blood-sucking species which will not normally enter fly traps.

**Insect enemies of the house fly (*Musca domestica L.*),** S. W. BROMLEY (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 2, pp. 145-152).—An annotated record of the author's observations, including data on hornets, robber flies, and dragon flies, and recent miscellaneous records.

**DDT as a residual-type treatment for control of houseflies,** A. W. LINDQUIST, A. H. MADDEN, H. G. WILSON, and E. F. KNIPPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 257-261).—When 5-day-old houseflies were exposed for 1 to 5 min. and then transferred to clean cages for observations on knock-down and kill, boxes treated with 5 percent each of DDT and cyclohexanone in Deobase gave slightly better results over a 207-day period than those treated with 5 percent DDT in kerosene. When applied to screen-wire cages with a paint brush (100 mg. DDT per square foot) 10 percent DDT gave better results dissolved in kerosene than in dibutyl phthalate. In synthetic-screen cages treated with DDT in various mixtures, a water suspension containing 5 percent each of DDT and talc and 2 percent of Dreft gave the best results over a 147-day period. None of the mixtures damaged the synthetic material. When applied on painted surfaces the DDT suspension was more effective than DDT in kerosene, but left a visible deposit. Flies introduced into plastered boxes treated with DDT in kerosene were knocked down in about 100 min. over a 200-day period after treatment; the time of knock-down of flies introduced into DDT-treated rooms with plastered walls ranged from 1.5 to 4 hr. over a 6-week period, but probably the flies did not contact the treated surfaces as frequently as in the boxes. One percent DDT in calcimine gave complete kill of flies, but the knock-down was less rapid than when used in kerosene. Strips of muslin treated with DDT and hung in the fly-rearing room gave almost complete kill of flies overnight and remained effective for 150 days. DDT dissolved in furniture polish and applied to mess hall tables is reported to have been effective. In boxes the mixture gave rapid knock-down on unpainted wood, but poor results on newly lacquered surfaces.

**Effect of temperatures on knockdown and kill of houseflies exposed to DDT,** A. W. LINDQUIST, H. G. WILSON, H. O. SCHROEDER, and A. H. MADDEN. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 261-264).—Houseflies exposed continuously to DDT-treated surfaces were knocked down much more quickly at 70° F. than at higher temperatures. When exposed at 70° and 95° for 5 or 10 min.—not enough to cause knock-down—in cages previously treated with DDT, and then held at different constant temperatures for 24 hr., very little difference in kill

occurred between flies exposed at the two temperatures. The flies always exhibited a higher mortality, however, at the lower holding temperatures, irrespective of the temperature at which exposed. Flies exposed to pyrethrum residue in treated cages showed a faster knockdown at 95° than at 70°, and a greater recovery when held at the lower temperature. Furthermore, a higher kill occurred after 24 hr. when exposure was at 95° than at 70°, irrespective of holding temperature. In all respects the results were the reverse of those obtained with DDT. These findings show that temperature may influence the effectiveness of DDT against a given insect species in various parts of the world; deposits of DDT are effective, however, over a wide temperature range.

**DDT and pyrethrum aerosols to control mosquitoes and houseflies under semi-practical conditions,** A. W. LINDQUIST, B. V. TRAVIS, A. H. MADDEN, H. O. SCHROEDER, and H. A. JONES. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 255-257).—Tests of these aerosols were conducted against mosquitoes and houseflies under semipractical conditions. To obtain the necessary concentration of DDT in Freon-12, an auxiliary solvent had to be used; cyclohexanone proved the most satisfactory of those tried. On the basis of equal amounts of total solution the DDT aerosol was shown to be as toxic as the pyrethrum aerosol to adult anopheline mosquitoes and far more toxic to houseflies; the knock-down of both insects obtained with DDT, however, was relatively poor. The desirable knock-down properties of pyrethrum and the toxicity of DDT to houseflies were obtained by combining the two insecticides in an aerosol. Addition of motor oil made it possible to secure the desired effect at a reduced concentration of both DDT and cyclohexanone.

**Anopheline surveys in the Fourth Service Command,** S. J. CARPENTER (*Jour. Natl. Malaria Soc.*, 4 (1945), No. 2, pp. 115-121, illus. 1).—The author, stationed at Fort McPherson, Ga., discusses anopheline survey methods employed at Army posts in the Fourth Service Command, mosquito collections during January-September 1944, and the prevalence of the common malaria mosquito on Army posts in the area during 1943-44.

**Studies on imported malarias.—I, Ability of domestic mosquitoes to transmit vivax malaria of foreign origin,** M. D. YOUNG, T. H. STUBBS, J. A. MOORE, F. C. EHRLMAN, N. F. HARDMAN, J. M. ELLIS, and R. W. BURGESS (*Jour. Natl. Malaria Soc.*, 4 (1945), No. 2, pp. 127-131).—On the basis of the experimental evidence it is believed that *Plasmodium vivax* malaria contracted in other countries and relapsing after return to the United States is infective to the native vectors, viz., the common malaria mosquito and *Anopheles maculipennis freeborni* Ait. These mosquitoes infected by the imported *vivax* malaria transmitted the disease by biting susceptible persons. Control measures are as necessary for imported malarias as for the native forms.

**Experimental infection of southern California mosquitoes with Wuchereria bancrofti,** O. K. SCOTT, C. S. RICHARDS, and E. A. SEAMAN (*Jour. Parasitol.*, 31 (1945), No. 3, pp. 195-197, illus. 2).—Numbers of military personnel have returned from the South Pacific showing early stages of infection with Bancroftian filariasis (elephantiasis); it was thus deemed of interest to determine which, if any, of the mosquitoes of hitherto uninfected parts of the United States could become carriers. From the results of the tests briefly reported upon it is concluded that if persons with circulating microfilariae were present in southern California, the southern house mosquito, *Culex erythrothorax*, and probably *C. tarsalis* would be vectors. Because so many mosquitoes died under laboratory conditions the facts were inconclusive as to *Aedes taeniorhynchus*, but the evidence at hand favored its being a less efficient vector than the above species. *Anopheles maculipennis freeborni*, *A. pseudopunctipennis*, and *C. stigmatosoma*, as well as *Culiseta*, would be unlikely vectors.

The selective penetration of fat solvents into the nervous system of mosquito larvae, A. G. RICHARDS, JR., and J. L. WEYGANDT (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 2, pp. 153-165).—Dye-penetration tests on over 100 assorted organic compounds indicated that penetration from the tracheae of the larvae (northern house mosquito used, and in most tests the yellow-fever mosquito also) results in selective accumulation in the central nervous system; other tissues seldom exhibited visible accumulation. This accumulation was correlated with and presumably conditioned by the presence of extremely thin lipid nerve sheaths. It follows that lipid-soluble substances with low water solubility will tend to accumulate in the insect nervous system whatever their mode of entry into the body. General cellular toxins (e. g., toluene) can thus give the appearance of being selective nerve poisons. The data presented are primarily qualitative but are apparently not wholly interpretable in terms of any one property, such as oil-water partition coefficients. The results are also not necessarily correlated with the toxicity or insecticidal efficiency of the various solvents. It appears likely that the permeability of the tracheal membranes is of the same general order as that of dialysis membranes.

A directional mosquito barrier trap, W. M. GORDON and E. J. GERBERG (*Jour. Natl. Malaria Soc.*, 4 (1945), No. 2, pp. 123-125, illus. 1).—The trap described utilizes screened panels and serves as a directional indicator of mosquito breeding. The screen frame increases the accuracy and efficiency of the barrier trap because the air movement is not appreciably "reflected" by the screening. Five species of mosquitoes were collected at Corpus Christi, Tex., the salt marsh mosquito making up 58.8 percent of the total catch. This equipment compared favorably with two electric traps placed in the same vicinity. Of the mosquitoes collected, 88 percent came from the southeast—the direction of the largest breeding area.

The use of house mosquito-proofing as an emergency malaria control measure in the Kentucky Reservoir, C. W. KRUSE and F. E. GARTRELL (*Jour. Natl. Malaria Soc.*, 4 (1945), No. 2, pp. 133-146, illus. 2).—The delay in closure of the Kentucky Dam prevented the impounding of the lake during the winter of 1943 and resulted in a schedule of partial impoundage for power production to an elevation of 350 ft. in late summer, 1944. The malaria control program was altered to meet the emergency; 1,032 houses were mosquito-proofed in nine counties within a mile of the 350-ft. contour of the reservoir in less than 6 mo. at a reasonable cost for current prices of materials and labor. Details are presented.

The development and use of DDT for the control of mosquitoes, E. F. KNIPPING. (U. S. D. A.). (*Jour. Natl. Malaria Soc.*, 4 (1945), No. 2, pp. 77-92).—The results of various phases of investigations of DDT for mosquito control at Orlando, Fla., are discussed. The fact that it has been found effective against both anopheline and culicine larvae and adults makes it a very useful all-purpose insecticide for mosquito control. DDT was found effective against the larvae at very low dosages when applied in the form of dusts, oil solutions, emulsions, or suspensions. As a dust, it was at least 25 times as toxic as paris green to larvae of the common malaria mosquito; sprays, however, are indicated to be the most desirable under most conditions. Although the low dosage of about 0.1 lb. per acre is recommended for routine treatments, higher dosages up to 1 lb. can be used for long-lasting treatments under some conditions. For controlling adult mosquitoes DDT is shown to be effective in liquefied-gas aerosols, especially when combined with pyrethrum, and its use in atomized sprays offers exceptional promise. It is believed that the greatest value of DDT in malaria control will be through its use as a residual spray; such applications are effective for several months in killing mosquitoes exposed to treated surfaces. Sprays applied by aircraft with recently developed equipment have proved effective both as larvicides and against adults; this method is already in military use against malaria and other mosquito-borne diseases. There are 23 references.

**Observations on the use of DDT for the control of *Anopheles quadrimaculatus*.** R. L. METCALF, A. D. HESS, G. E. SMITH, G. M. JEFFREY, and G. W. LUDWIG (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 27, pp. 753-774, illus. 5).—Laboratory and field studies were conducted in the Tennessee Valley (1943-44) to provide information on the use of DDT as a residual house spray against adults of the common malaria mosquito and on its effectiveness as an anopheline larvicide and adulticide when applied as a dust, spray, or thermal aerosol. The results are presented and summarized in detail; some of them are as follows: The median lethal doses in spray chamber tests for adult ♂♂ and ♀♀ were about 7 and 12 mg. per 1,000 cu. ft., respectively, as compared with 1 and 1.5 mg. of pyrethrins. Sprayed on wallboard at rates of 40, 200, and 1,000 mg. of DDT per square foot, the percentage of kill was determined primarily by the period of contact rather than by the rate; as to residual toxicity, sufficient to produce 100-percent kill of adults exposed for 60 min. persisted for 4-16 weeks, depending on the dosage. Wooden nail kegs treated at rates of 20, 200, and 2,000 mg. per square foot retained a high residual toxicity to adults for 18-22 weeks. Barns treated at a rate of about 200 mg. per square foot remained almost free of flies and mosquitoes for at least 11 weeks. Unoccupied houses treated at 250 mg. per square foot remained toxic to adult mosquitoes for at least 15 weeks; occupied dwellings lost their toxicity somewhat more rapidly. Loss of residual toxicity appeared due primarily to flaking off of DDT crystals; on smooth surfaces the loss was more rapid. Of the mosquitoes escaping from a treated house, 95-100 percent had received lethal doses before leaving. Exposure to DDT surfaces reversed their normal light reactions, making them positively phototropic. Solutions of 2.5 percent in kerosene effectively controlled the larvae when applied by boat oiling units at about 0.1 lb. per acre. DDT had to be diluted with 95 percent soapstone before a satisfactory airplane-dusting mixture was obtained. Certain polymethylnaphthalenes (Velsicol's) of high boiling point and high solubility for DDT proved ideal solvents for liquid solutions to be applied by airplane. A Stearman airplane was more satisfactory for applying the larvicidal sprays than the Cub type plane. DDT dusts and thermal aerosols gave no evidence of injury to fish or other aquatic organisms when applied by airplane at rates of 0.1 lb. DDT per acre. Five-percent solutions in kerosene applied at rates of about 0.25 lb. DDT per acre were destructive to aquatic insects living in close contact with the water surface—particularly to Hemiptera and Coleoptera.

**DDT residual sprays applied in buildings to control *Anopheles quadrimaculatus*.** J. B. GAHAN and A. W. LINDQUIST. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 223-230).—DDT residual sprays were applied to the inside walls and ceilings of nearly every building in two 9-sq.-mile areas near Stuttgart, Ark., to determine the effectiveness against the common malaria mosquito of a single application and to find whether the general population of this species could be reduced in this way. One area was sprayed at the rate of 208 mg. DDT and the other at 56 mg. per square foot. Ten afternoon counts were made in these buildings during June-October, the last one 3.5 to 4.5 mo. after application. The residues were found to have reduced the number of mosquitoes resting in the heavily treated buildings over 99 percent and in the lightly treated ones 91 percent, throughout the entire season. More adults were found in the morning than in the afternoon, but a high degree of reduction was also observed at the latter time. Larval counts in rice fields indicated reductions of 63 and 57 percent in the heavily v. lightly treated areas. When untreated nail kegs were employed to sample the adult population, results were too erratic to give a true index of the relative numbers present.

**DDT as a residual-type treatment to control *Anopheles quadrimaculatus*—practical tests.** J. B. GAHAN, B. V. TRAVIS, F. A. MORTON, and A. W. LINDQUIST. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 231-235).—DDT applied

in various carriers near Tallahassee, Fla., and Stuttgart, Ark., at dosages of 65 to 400 mg. per square foot protected buildings from spontaneous infestations of adults of the common malaria mosquito for as long as 70 days. When mosquitoes were present in the treated buildings, the number was always much lower than prior to spraying or in untreated buildings used as controls. The chemical activated the mosquitoes, causing many of them to leave the buildings, but a large portion of those escaping had obtained lethal dosages. In one test numerous adults of *Psorophora* mosquitoes—not considered as disease carriers—were killed when a light was used to attract them to a treated building. In a simulated practical test 100 percent kill was obtained over an 84-day period when laboratory-reared adults of the common malaria mosquito were confined in a treated room for 24 hr., but on one occasion some individuals continued to bite a host exposed in this room until a knock-down of 99 percent had occurred.

**DDT as a residual-type spray to control disease-carrying mosquitoes—laboratory tests,** J. B. GAHAN, B. V. TRAVIS, and A. W. LINDQUIST. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 236-240).—In laboratory tests DDT proved effective as a residual-type spray against adults of the common malaria and the yellow fever mosquitoes, when applied on wooden boxes and canvas cages at 10 to 400 mg. per square foot. Comparative tests indicated a water emulsion or suspension to be equally effective on wood and both slightly superior to a kerosene spray. Exposure for at least 2 to 4 hr. was required before all mosquitoes obtained a lethal dose. Many of the residues were fully effective after 32 weeks, on 24-hr. exposure. Sunlight had a deleterious effect, but the loss in toxicity occurred very slowly. DDT residues were highly toxic on unpainted surfaces and on surfaces covered with two coatings of cold water-casein paint that had been applied less than 2 weeks before; the residue was much less effective, however, on surfaces recently covered with oil paint. DDT activated mosquitoes resting on treated surfaces, causing them to fly, but not before most of them had obtained a lethal dose.

**DDT as an anopheline larvicide—laboratory tests,** C. C. DEONIER, J. D. MAPLE, H. A. JONES, E. HINCHEY, and P. M. EIDE. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 241-243).—The high toxicity and physical properties of DDT render it very adaptable as a mosquito larvicide. In laboratory tests using various methods of application and different dosages against larvae of the common malaria mosquito, the weathering of surface applications was determined by subjecting to repeated artificial rains. DDT was toxic as a dust to 62 percent of the larvae when applied at the rate of 0.0001 lb. per acre; as a suspension at 0.01 p. p. m. it gave practically 100 percent mortality in 48 hr., being more than 100 times as toxic as phenothiazine. DDT is adaptable to surface applications in dusts and in oils and to use in emulsions and suspensions; it is resistant to wetting and can be used in dusts prepared from solid solutions in various diluents. In stable emulsions and suspensions at 0.1 p. p. m., it remains effective for a long time.

**DDT as an anopheline larvicide—preliminary field studies,** C. C. DEONIER, R. W. BURRELL, J. D. MAPLE, and J. H. COCHRAN. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 244-249).—In preliminary field tests DDT was effective against larvae of the common malaria mosquito at dosages as low as 0.05 and 0.1 lb. per acre, but the lasting effects were low and breeding was resumed within a few days. Applications as dusts at 1 to 2 lb. per acre provided effective lasting control if applied in vegetative growth; in breeding areas having light to moderate vegetation the heavy treatments usually show a reduction of breeding for 1 to 2 weeks, but wind action and other surface disturbances break up the protective dust cover and permit breeding to recur. Five percent DDT in petroleum oil was effective in average vegetation at only 1 qt. per acre; a larger quantity may be needed to secure adequate coverage in many situations. Application may be made by pouring

or spraying, or from dispensers or porous materials; various methods developed for other larvicultural oils may also be used. A long-lasting treatment, using oils, may be attained by the slow release of the larvicide. Wind and wave action in breeding areas having light to moderate vegetation break up the surface film of oils and DDT deposits the same as with dusts. In xylene emulsion DDT was toxic at 0.05 p. p. m. A long-lasting larvicide was obtained with higher concentrations in colloidal suspension, but these were toxic to animal life. Concentrated DDT mixtures would greatly simplify problems of transportation and treatment.

**DDT for the control of *Psorophora* mosquitoes,** C. B. WISECUP and C. C. DEONIER. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 2, pp. 250-252).—Small-scale field tests of DDT for controlling *Psorophora* spp. were conducted in roadside ditches and pasture pools near Orlando, Fla., during March-April 1944. Prehatching sprays of fuel oil or xylene emulsion containing DDT gave perfect control at 0.1 and 0.2 lb. DDT per acre after 2 weeks' or more exposure prior to flooding of the treated areas; a self-releasing oil dispenser applying DDT at 1.8 and 0.1 lb. per acre also gave perfect results before the second flooding. DDT dusts proved unsatisfactory under the same conditions. Surface applications made after the eggs had hatched indicated that use of less than 0.1 lb. DDT per acre satisfactorily controlled all but the largest larvae, whether applied in dusts or sprays, in oil impregnated sawdust, or in poured oil.

**Future research in beekeeping,** J. I. HAMBLETON. (U. S. D. A.). (*Amer. Bee Jour.*, 85 (1945), No. 8, pp. 273-275).—A discussion of the needs in future research, with special reference to pollination, honey plants, bee breeding, diseases, poisoning, beekeeping equipment and management, bee products, and economic information.

## ANIMAL PRODUCTION

**Some present day aspects of livestock nutrition,** R. C. MILLER. (Pa. State Co.). (*Cornell Vet.*, 35 (1945), No. 2, pp. 128-136).—A general discussion.

**The importance of "folic acid" in rations low in nicotinic acid,** W. A. KREHL and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 173-179, illus. 1).—Young dogs on a low synthetic nicotinic acid ration responded poorly to standard doses of nicotinic acid and failed to gain, with death soon occurring. Dogs responded favorably, however, when the basal ration was supplemented with a folic acid concentrate derived from solubilized liver extract, and the same experimental conditions prevailed. Such dogs could be used in repeated assays.

**Thyroxine for increased milk and egg production,** C. W. TURNER and E. P. REINEKE. (Mo. Expt. Sta.). (*Sci. Mo.*, 60 (1945), No. 3, pp. 233-234).—A product containing 3 to 4 percent thyroxine was produced by proper iodinated casein which, added to the rations of cows and chickens in proper amounts, increased and extended the productivity and feathering.

**Proteins and vitamins in relation to nutritional deficiencies of mother's milk,** M. L. MORRIS, F. I. NAKAMURA, and L. N. ATKINSON (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 819, pp. 336-342, illus. 8).—The injection of pups with liver extract improved the blood count, hemoglobin, and general condition. Young grass was a good source of needed nutrients for omnivorous and herbivorous animals.

**The monthly protein and phosphorus contents of two important range grasses of southern New Mexico,** W. E. WATKINS and J. H. KNOX. (N. Mex. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 297-305).—Monthly variations in protein and phosphorus of mesa dropseed grass (*Sporobolus flexuosus*) and black grama (*Bouteloua eriopoda*), selected as important range grasses, are given for 98 mo. With the usual light rains of winter moderately high protein values were

found, but with abnormal winter rains the grasses may so leach that they become low in protein and phosphorus by early spring. Phosphorus deficiency is more severe and of longer duration than that of protein. The phosphorus needs of range cattle are met except for a short period at the peak of the growing season. Breeding cows have given satisfactory production on this range when the phosphorus intake was no lower than 8.5 gm. per hundredweight, and the inorganic phosphorus of the blood was not below 3 mg. during the critical winter period.

Riboflavin content of Canadian feedstuffs, E. V. EVANS, D. M. YOUNG, and H. D. BRANION (*Sci. Agr.*, 25 (1945), No. 9, pp. 542-545).—Microbiological assays of 241 samples of feeds for riboflavin showed much variation.

The chemical composition of feeding stuffs available in Canada, I. MOTZOK, D. C. HILL, H. D. BRANION, W. D. M. GRAHAM, and H. W. SCHMALTZ (*Sci. Agr.*, 25 (1945), No. 9, pp. 525-532).—A survey of 80 commercial feeds in Canada showed the need for individual chemical analyses rather than depending on averages.

Inspection of commercial feeding stuffs, F. W. QUACKENBUSH ET AL. (*Indiana Sta. Cir.* 304 (1945), pp. 24, illus. 1).—A summary is given of the guaranteed and found analyses of 3,662 samples of commercial feeding stuffs conducted in 1944, together with the claims and assays of 44 samples of vitamin D supplements for poultry (E. S. R., 92, p. 820).

Effect of age on the weight and production of range cows, J. H. KNOX and M. KOGER. (N. Mex. Expt. Sta.). (*Cattleman*, 32 (1945), No. 1, pp. 22, 24, illus. 1).—The age of maximum weight and production of range cows on the station range from 1939 to 1944 was from 6 to 8 yr. Cows might be sold as early as 8 yr. of age without reducing the amount of beef produced or the cash income. Comparison is given of the results from selling cows at 8, 9, and 10 yr. of age.

A method for estimating weaning weights of range calves at a constant age, M. KOGER and J. H. KNOX. (N. Mex. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 285-290, illus. 1).—A convenient graphic method is presented for estimating weaning weights of range calves at constant ages. Weaning weights for 8 yr. were used for deriving the estimating equation, which was fitted to a nomographic chart after making corrections for differences in birth dates and age and variations in growth rate. The method does not differ greatly in principle from those used by Bywaters and Willham (E. S. R., 75, p. 528), Whatley, Jr., and Quaife (E. S. R., 79, p. 664), and Phillips and Brier (E. S. R., 83, p. 235) in adjusting weights of pigs and lambs.

Phosphorus supplements for beef cows and heifers, S. S. WHEELER (*Wyoming Sta. Bul.* 269 (1945), pp. 71, illus. 5).—The results of a series of phosphorus feeding experiments with beef cattle are reported in three sections: (1) Phosphorus supplements for wintering beef cows in dry lot, (2) bonemeal as a supplement for range breeding cows and heifers, and (3) phosphorus requirements of beef heifers.

The first of these was concerned with the effects of P supplements on gains in weight, reproduction, and blood P levels on groups of beef cows fed a basal ration of native hay and sunflower silage during three winter feeding periods averaging 172 days in length. Three other lots received daily supplements of 0.05 lb. monocalcium phosphate, 0.1 lb. steamed bonemeal, or 0.75 to 1 lb. cottonseed meal in separate groups. On the basal ration alone there was an average winter loss of 25.6 lb., but with the supplements of monocalcium phosphate, steamed bonemeal, and cottonseed meal the average winter gains were 66.6, 43.4, and 36.3 lb., respectively. The average total pasture gains or losses were 65.5, -293.3, -181.3, and -55.6 lb. for the basal ration alone or when the respective supplements were supplied with the winter rations. There was a significant inverse correlation between the winter and summer gains. The group of cows receiving no P supplement had the highest reproductive efficiency, followed in order by the lots receiving supplements

of steamed bonemeal, monocalcium phosphate, and cottonseed meal, but the differences in reproductive efficiency were not significant. There was no effect of the different supplements on the weight of the calves. The serum Ca and P during the winter feeding period were not related to variations in the intake. These results are based on about 26 cow years with each supplement or on the basal ration only over a 3-yr. period. The study was initiated with 28 purebred cows and heifers divided into 4 lots.

The second study was made with 150 grade Hereford cows and heifers ranging from  $1\frac{1}{2}$  to 8 yr. of age, divided into 2 groups equalized on previous breeding performance, age, and weight. One lot received bonemeal with salt and the other had access to salt only. All of the cows were wintered each year on separate pastures of like carrying capacity, water supply, and natural shelter. Limited amounts of hay, cottonseed cake, and soybean cubes were fed to both groups, but 1 group received rye hay and the other barley hay, with some millet hay and Russian-thistle in either case. In the first year, there was an advantage of slightly less than 6 lb. for the cows and heifers that had received steamed bonemeal. By the end of the second year the cows and heifers fed bonemeal had gained 26.4 lb. more than the group which received no mineral supplement, but the difference was not statistically significant. Cows and heifers fed bonemeal were superior to those not fed bonemeal in practically every respect from the standpoint of reproductive performance. Those with access to bonemeal weaned a larger percentage of their calves, fewer cows failed to breed, fewer cows lost their calves, and calving difficulties were less. Blood analyses showed cows fed bonemeal had appreciably higher levels of blood phosphorus than the cows and heifers fed no bonemeal, but no deficiency of P was shown by those not fed bonemeal. The average concentrations of inorganic P in the blood was 3.8 mg. percent compared with 4.3 mg. percent for cows and heifers fed bonemeal. The green forage or growing grass contained much more P than dry or dead grass, and in June the P content of the blood returned to about 5.5 mg. percent.

In the third experiment the effects of feeding different levels of P upon the growth of beef heifers, changes in blood P, and reproductive behavior were investigated. Heifers from dams fed no P supplements were selected 12 days after weaning when they averaged 386 lb. in weight and were divided into 3 lots of 5, 5, and 6 grade heifers, which were designated as lots 1, 2, and 3. Six purebred heifers averaging 643.3 lb. in weight were included as a fourth lot. Three levels of P were provided in the rations—low, medium, and high. These rations consisted, respectively, of native hay, wheat straw, and dry molasses beet pulp; and native hay, cottonseed meal, and bonemeal in the second and third lots, with more bone-meal for the third group. The purebred heifers received sunflower silage and pasture. At the end of the first year of the experiment the average gains of the 4 lots of heifers were for lot 1, 228 lb.; lot 2, 230 lb.; lot 3, 236 lb.; and lot 4, 282 lb. Variance analyses of gains showed that there were no significant differences between the lots during the first, second, and third years. Pronounced variation was noted in all heifers of lot 1 at one time or another, in accord with a low blood P, and estrus failed or was delayed. Purebred heifers with access to pasture and fed a liberal winter ration adequate in P showed no evidence of retarded or irregular estrus, conceived regularly, and produced a high percentage of normal calves. Rations including 9.7 gm. or less of P per day caused anorexia and retarded growth when fed to beef heifers for more than 2 yr., but an average daily P intake of 13.4 gm. was sufficient to prevent symptoms of P deficiency and maintain a satisfactory rate of growth from 9 mo. to maturity.

**Effect of molasses and molasses feed on quality of beef,** R. J. WEBB and S. BULL (*Illinois Sta. Bul. 510 (1945)*, pp. 485-496).—Comparison of the gains and

quality of beef produced by 3 lots of 10 Hereford steers each in a 150-day feeding period showed that the substitution of molasses for all the corn reduced the rate of gain, increased the amount of concentrates and roughage required to produce 100 lb. of gain, reduced the market grades of the slaughter cattle and carcasses, and increased the rate of shrinkage. The substitution for corn, soybean meal, and alfalfa hay of molasses feed, which consisted of cane molasses 40 parts, ground corn 20, ground oats, 20, soybean meal, 15, cut alfalfa 20, limestone 1, and salt 1 part, had no effect on the rate of gain or the concentrates and silage required to produce 100 lb. of gain, but the hay requirement to produce 100 lb. of gain was increased about 50 percent, the market grade of the steers and carcasses was lowered, and the shrinkage in shipping the animals to Chicago was increased. The texture of the lean of the rib was unaffected by differences in the rations. The color of the carcasses from steers receiving molasses feed was not as uniform as in the other groups.

**Cobalt deficiency**, R. A. MCINTOSH (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 7, pp. 179-182).—A deficiency of cobalt is a common cause of depraved appetite in young cattle from the time rumination starts until a year or more of age. The appetite is quickly improved by providing cobalt.

The accuracy of measurements and weights of sheep, R. W. PHILLIPS and J. A. STOEHR. (U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 311-316, illus. 1).—Direct measurements as well as weights were recorded on groups of 11 ewes, with each measurement taken 11 times on each animal. The measurements appearing to be most accurate and at the same time measuring characteristics which experimenters may desire to study include height at withers, length from midfront of scapulae to pin bones, width at shoulders, depths of chest and middle, circumferences of chest and middle, and circumference of foreshank. Measurements were made from enlarged photographs in one group, but these and measurements of ewes in fleece were less accurate than direct measurements on sheared animals. Many measurements may be taken with reasonable accuracy, but there were difficulties in interpreting measurements in terms of carcasses or other values. Care in selecting useful measures seems essential, and they should be limited to those which are related to external measures and merit. In each group the averages, standard deviations, and coefficients of variation are calculated.

Tolerance of lambs for blackstrap molasses, H. M. BRIGGS and V. G. HELLER. (Okla. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 71 (1945), No. 2, pp. 81-87).—Blackstrap molasses was substituted for corn at 5-, 10-, and 15-percent levels in a basal ration of corn, cottonseed meal, and alfalfa hay for eight wether lambs in each of two digestion trials to ascertain at what levels of blackstrap feeding the apparent digestibility of the ration is altered (E. S. R., 90, p. 384). The lambs' ability to digest protein was not measurably influenced except at the 15-percent level of molasses. Fat digestion coefficients were reduced at 10- and 15-percent levels of molasses. Neither fiber nor nitrogen-free extract were significantly influenced at any of the levels of molasses employed. The average apparent digestibility in each of the two trials with the basal ration only and with 5-, 10- and 15-percent molasses substitutions were, respectively, for the protein 74.1, 73.4, 73.3, and 72.1 percent; fat 66.9, 65.4, 64.5, and 61.0; crude fiber 54.6, 54.4, 55.2, and 54.9; and nitrogen-free extract 85.9, 85.5, 85.1, and 84.5 percent.

The feeding of goats, M. H. FRENCH (*East African Agr. Jour.*, 10 (1944), No. 2, pp. 66-71).—General information on the maintenance, mineral, vitamin, and water requirements for goats and the use of several feeds for purebreds and crossbreds.

Hormonal stimulation of estrus and ovulation in sheep and goats, R. W. PHILLIPS, R. M. FRAPS, and A. H. FRANK. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 165-179).—A review, with bibliography of 72 references.

**Feeding and management of market hogs.** J. M. FARGO, G. BOHSTEDT, and J. J. LACEY (*Wisconsin Sta. Bul.* 454, rev. (1944), pp. 24, illus. 5).—A further revision (E. S. R., 90, p. 385).

**Protein supplements in pig rations:** A comparison of the effects of protein supplements fed to pigs on alfalfa pasture and in dry lot, F. B. HEADLEY. (Coop. U. S. D. A.). (*Nevada Sta. Bul.* 175 (1945), pp. 13, illus. 2).—Further studies of swine feeding (E. S. R., 90, p. 514) are briefly reported. Additions of protein supplements to pig rations on alfalfa pasture and grain did not materially increase the rate of gain, although skim milk proved to be a stimulant. Gains were increased by protein supplements and skim milk in a dry lot ration of grain and alfalfa hay. The first of these experiments was conducted on alfalfa pasture with three lots of eight pigs each for 114 days, which showed clearly that there was little advantage in the gains from the additional protein supplement other than skim milk in a basal ration of barley or wheat with alfalfa pasture.

**Distillers' feed products in rations for growing pigs.** R. E. SYNOLD (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 237-246).—A series of four trials was conducted with protein supplements which included distillers' solubles or distillers' dried grains with alfalfa meal and steamed bone meal. The rations included ground yellow corn as the basis for the studies of the protein supplements for pigs from 30 to approximately 145 lb. in weight. The gains produced indicated that the distillers' feed products did not contain all of the essential amino acids as a level required to promote a satisfactory rate of growth. In the first trial, 1 of the 3 lots of 10 pigs each fed dried grains in a protein supplement made slower gains than 1 lot fed distillers' dried solubles, from which it was concluded that the added fiber hindered satisfactory gains. In the second experiment, with 3 lots of 10 pigs each, practical rations for growing pigs were formulated when distillers' dried solubles were used as a vitamin supplement with a small amount of animal protein or protein entirely from vegetable sources, which produced results equal to those of a control ration. Additions of linseed meal to the all-vegetable ration in the third trial increased the rate and efficiency of gain. Little difference was noted in performance between high and low animal protein rations. Slightly faster gains were produced by the low-protein rations than by the high-protein rations up to 100 lb. in weight, but there was little difference in performance during the whole growth period. Indirect evidence indicated that an increase in the Ca and P level of the all-vegetable protein supplement when fed on pasture would result in more rapid gains. Less supplement was required per 100 lb. of gain in all trials with those supplements containing the highest percentages of crude protein. However, all the lots required about the same quantity of protein per 100 lb. of gain. Costs of gain were reduced by pasture, as indicated by 6 lots of 10 pigs each, one-half of which were fed in dry lot and one-half on pasture.

**Incubated eggs and dead poultry as hog feed.** A. E. TOMHAVE and E. HOFFMANN. (Univ. Del.) (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 247-249).—Although Willman et al. (E. S. R., 87, p. 101) concluded that raw eggs are as efficiently utilized by pigs as cooked eggs, there is still doubt. Therefore, dead poultry from poultry farms and unhatched incubator eggs were fed with yellow corn to hogs for 15 weeks. In three groups of 50-lb. pigs, one group of 3 pigs was fed 3.6 lb. of yellow corn daily per 100 lb. live weight and all the unhatched eggs they would consume, and another group of 5 pigs received the same amount of yellow corn and all the dead poultry they would consume. A third group of hogs serving as controls received 4.5 lb. per day of a mixed ration of 100 lb. yellow shelled corn, 10 lb. tankage, 5 lb. alfalfa meal, and 5 lb. linseed meal. All groups had access to minerals. The average daily gains on the control ration were 0.89 lb. as compared with 0.86 lb. with the unhatched eggs and 0.76 lb. with the dead poultry.

Studies on the metabolism of nicotinic acid in the horse, P. B. PEARSON and R. W. LUECKE. (Tex. Expt. Sta.). (*Arch. Biochem.*, 6 (1945), No. 1, pp. 63-68).—Evidently nicotinic acid is synthesized by the body of the horse. When the daily intake of four weanling Shetland ponies was reduced from 0.10 to 0.01 mg. per kilogram of body weight per day, the excretion in the feces and urine exceeded the intake. An average of 43 percent of the nicotinic acid was excreted in the urine when 5 gm. were fed daily. Trigonelline and *N*-methyl nicotinamide are not the principal end products of metabolism in the horse, as they are in the dog, man, and rat.

Chick rearing, I, III, T. BARTON MANN (*Jour. Agr. Sci. [England]*, 35 (1945), No. 2, pp. 95-97, 101-107).

I. *The effect of diet on mortality with special reference to six-day disease.*—The results of three tests clearly indicate that trichloroethylene-extracted palm-kernel meal is not the cause of "six-day disease." The chicks in the three tests were raised on pasture for 13 days. In the first test, 3 groups of 56 or 57 chicks received rations of millers' offals, cereals, and skim milk or skim-milk powder, or the replacement of 10 or 20 percent of the bran by trichloroethylene-extracted palm-kernel meal. There was no evidence of six-day disease in any of the groups. In the second test, 1 group of 54 chicks received 12 percent of trichloroethylene-extracted palm-kernel meal but a higher protein ration was included. Six-day disease was produced in a number of the individuals, indicating that this strain of chicks was not especially resistant to the condition. In a third test, mortality of 60 chicks was 43 percent, with characteristics of the disease on a ration with no extracted meal.

III. *The effect of diet on vitamin A, xanthophyll, and carotene metabolism.*—The vitamin A metabolism was inversely affected when meat meal having a vitamin-A-consuming power in vitro was included in the ration of chicks. The average vitamin A content of newly hatched chicks was 200 to 250 International Units per gram, which was about 100 I. U. less than in the egg from which the chick was hatched. It was noticed in tests with six groups of chicks on rations of different feeds and different amounts of cod-liver oil that when fish meal having no vitamin-A-consuming powers in vitro was fed to chicks in a basal ration which produced negligible mortality, additions of such fish meal to the ration did not apparently increase mortality. When fish meal having a vitamin-A-consuming power in vitro was added to the basal ration in appreciable amounts, mortality was increased. There was a depression in the pigment deposition in the legs of chicks to 28 days as a result of feeding fish meal. It was noted that a ration containing vitamin A to the extent of over 43 I. U. per 100 gm. of feed but with ground oats promoted a higher storage of vitamin A in carcasses than a basal ration to which was added 2,000 I. U. of vitamin A from cod-liver oil. A tentative method is presented in the appendix for the chromatographic estimation of vitamin A from absorbing pigments as xanthophyll,  $\beta$ -carotene, and other carotenes which may interfere with the spectrographic estimation of the vitamin, using the  $SbCl_3$  tests in residual oils from meat and fish meals.

Amino acid needs of poultry, C. R. GRAU. (Univ. Calif.). (*Flour & Feed*, 46 (1945), No. 2, pp. 36-38).—A summary of the requirements of the chick and the ability of various protein feeds to furnish needed amino acids.

Critical vitamins in rations for baby chicks, L. R. RICHARDSON, A. G. HOGAN, and H. L. KEMPSTER (*Missouri Sta. Res. Bul.* 390 (1945), pp. 12).—A basal ration of yellow corn 22 percent, wheat bran 3, wheat middlings 9, soybean meal 15, casein 20, glucose 15, lard 5 percent, and gelatin, minerals, and other substances was adequate in protein, minerals, and energy but contained no water-soluble vitamins except those supplied by the yellow corn, wheat bran, wheat middlings, and soybean

meal. To this was added varying amounts of manganese, vitamin A, vitamin D,  $\alpha$ -tocopherol, and 2-methyl-1, 4-naphthoquinone. In individual trials the different components of the vitamin B complex were added singly and in combination. Thiamine and pyridoxine were present in adequate amounts. Symptoms similar to those frequently seen in chicks sent in by poultrymen were observed when pantothenic acid was omitted from the vitamin mixture. Mild deficiencies of choline were observed in chicks sent in from hatcheries. The rate of growth was depressed and the incidence of perosis increased when nicotinic acid was omitted from the vitamin mixture, but this vitamin is probably never deficient in practical rations. A mild deficiency of biotin was observed, but it seems doubtful if this exists under practical conditions. When all the recognized synthetic vitamins of this group were added to the basal ration, about 2 percent of the chicks still developed perosis, indicating that this condition is due to an unrecognized vitamin. Evidently rations may be much superior and still be deficient in riboflavin. These studies were carried on with 9 groups of 4 to 101 chicks in each, with the various B complex supplements used individually or collectively.

**Studies on vitamins  $B_{10}$  and  $B_{11}$  and related substances in chick nutrition,** G. M. BRIGGS, JR., T. D. LUCKEY, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 303-312).—Methods for purification of vitamin  $B_{10}$  and  $B_{11}$  for chick growth and feathering (E. S. R., 92, p. 829), based on dialysis procedures, chromatogram separation, and  $Ba(OH)_2$ -ethanol precipitations are suggested. Vitamin  $B_{11}$  has been concentrated sixteen-hundred-fold from solubilized liver. The necessity of another factor to maintain normal hemoglobin formation is suggested.

**Studies on organic factors required for prevention of anemia in chicks,** M. L. SCOTT, L. C. NORRIS, G. F. HEUSER, and W. F. BRUCE. (Cornell Univ.). (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 291-298).—Evidence is presented that the *Lactobacillus casei* factor of Snell (E. S. R., 93, p. 660) and either the lactone of 2-methyl-3-hydroxy-4-hydroxymethyl-5-carboxypyridine or the lactone of 2-methyl-3-hydroxy-4-carboxy-5-hydroxymethylpyridine are required for the complete prevention of the macrocytic, hypochromic anemia that develops in chicks fed a purified diet. The 5-carboxy lactone is designated  $\alpha$ -pyracin and the isomeric 4-carboxy lactone  $\beta$ -pyracin.  $\beta$ -pyracin was more active than  $\alpha$ -pyracin in promoting growth, but was only slightly more effective in preventing anemia. Lesser quantities of  $\beta$ -pyracin and the *L. casei* factor were required to prevent anemia than were required to promote growth. When the *L. casei* factor alone was added, the anemia developing was a normocytic, hypochromic type. A macrocytic, normochromic type of anemia occurred when  $\beta$ -pyracin alone was added to the ration. The growth and survival to 3 weeks of age of lots of 15 chicks each, receiving supplements of  $\alpha$ -pyracin, *L. casei* factor, the factor S concentrate of Schumacher et al. (E. S. R., 84, p. 94), and pyridoxal singly or in various combinations and in comparison with no supplements or commercial chick rations served for determining the above conclusions.

**Kudzu in the ration of growing chicks,** H. D. POLK and M. GIEGER (*Mississippi Sta. Bul.* 414 (1945), pp. 14, illus. 3).—There was no significant difference in weight of chicks fed for 8 or 9 weeks on rations containing alfalfa meal 9 percent plus 3 percent dried milk, kudzu leaf meal 9 percent, kudzu meal 9 percent plus 3 percent dried milk, and kudzu meal 10 percent. Only 3.10 lb. of feed per pound of gain was required as an average of the three lots on alfalfa meal with milk, but 3.20, 3.25, and 3.30 lb. of feed were required with the protein supplements of kudzu leaf meal without milk, kudzu meal with milk, and kudzu meal without milk, respectively. No trouble was encountered from feather picking or cannibalism in any of the three tests. There were 40 Barred Plymouth Rock X White Leghorn chicks in each

of the four lots fed in the trials in early winter, late winter, and summer. Kudzu leaf meal carefully dried by methods described contained 5,289.97 µg. of riboflavin per pound and 128.96 µg. of carotene per gram. Kudzu meal averaged 3,413.21 µg. of riboflavin per pound and 81.58 µg. of carotene per gram.

**Algaroba bean meal in turkey rations,** C. I. DRAPER (*Hawaii Sta. Cir.* 23 (1945), pp. 5+, illus. 1).—Groups of 11 poult were fed in duplicate a basal ration with 0, 20, 40, 60, 80, and 100 percent of this meal during the starter period to 8 weeks of age and during the growing period from 8 to 28 weeks. The average 28-week weights of the duplicate lots fed these rations were 13.24, 13.25, 11.62, 15.18, 13.08, and 13.08 lb., respectively. At 28 weeks of age the lots receiving 41 percent of the meal were as good in fat and feathering as the control lots. Turkeys may utilize to better advantage a ration with a higher fiber content as they approach maturity than at younger ages.

**Turkeys fed grass clippings gain weight more rapidly and are marketable sooner,** P. H. MARCOLF (*Pennsylvania Sta. Bul.* 464, Sup. 3 (1945), pp. 2-3, illus. 3).—In a study of the effect of lawn clippings from the golf course on the nutrition of turkeys in confinement using 4 groups of 88 poult divided into 2 groups each of ♂♂ and ♀♀, it was shown that at the end of 28 weeks the group of ♂♂ fed grass clippings artificially dried and soaked in water overnight weighed an average of 19.2 lb. as contrasted with an average of 18 lb. for the group of turkey ♂♂ which received no green feed. Groups of ♀♀ receiving green feed were also heavier, and both ♂♂ and ♀♀ receiving green feed were of better quality, than groups which received no green feed. Apparently turkeys in confinement fed the green feed gained weight and obtained better market quality more rapidly than those allowed only dry forage.

## DAIRY FARMING—DAIRYING

**Sorghum feeds for dairy cattle—I, The effects of restricting lactating cows to Atlas sorgo rations,** H. E. BECHTEL, F. W. ATKESON, M. KOGER, J. S. HUGHES, W. J. PETERSON, and W. W. THOMPSON. (*Jour. Dairy Sci.*, 28 (1945), No. 7, pp. 531-544, illus. 2).—In study of Atlas sorgo rations for milk production, 10 cows were restricted to sorgo rations for from 134 days to over two lactation periods. The cows were started on the sorgo rations from 57 days before calving to 17 days after calving. The experimental rations fed twice daily consisted of Atlas sorgo stover, Atlas sorgo silage,—a grain mixture of 1 lb. of stock salt and 100 lb. of ground sorgo grain, and block salt with molasses in part of the rations. Milk production, live weight, and breeding records were recorded for each of the cows. In general, dairy cows restricted to Atlas sorgo rations received approximately 46 percent of the dry matter from stover, 31 percent from silage, and 23 percent from the grain. Such cows produced less milk than normal. The weight of the milk produced on the sorgo ration was only 52 percent and 24 percent, respectively, during the first and second years of that produced on the pre-experimental rations. The percentage butterfat also averaged lower on the sorgo ration. Body weight declined, and the cattle developed an emaciated, unkempt, and malnourished appearance, with one cow dying. Only 1 of the 15 calves born during the sorghum feeding period showed signs of vitamin A deficiency. Normal blood calcium and inorganic phosphorus were found. The carotene value of the blood serum varied from an average of 249 to 93 µg. per 100 cc. of serum. Hemoglobin values were usually less than 10 gm. per 100 gm. of blood. There were no significant changes in the lymphoid or myeloid elements. The experimental cows received from the sorghum feeding not more than 60 percent of the digestible protein and 80 percent of the total digestible nutrients needed, and the carotene intakes and

blood carotene were frequently below the needs for normal reproduction. The decreased milk production may have resulted from the reduced intakes of total digestible protein and total digestible nutrients or they may have resulted from other deficiencies in this sorgo ration.

**Effect of feeding iodinated casein on production and health of milking cows, D. M. SEATH, C. BRANTON, and A. H. GROTH.** (*La. Expt. Sta.*). (*Jour. Dairy Sci.*, 28 (1945), No. 7, pp. 509-517, illus. 2).—The effects of iodinated casein (Protamone), discussed by Reineke and Turner (E. S. R., 89, p. 435), on the production and health of Jersey and Holstein milking cows under Louisiana conditions were investigated. There were 6 cows equally paired for the first trial. After 8 weeks, in which one-half of the cows were fed 15 gm. of iodinated casein per day, the groups were reversed and fed for 7 weeks after a 3-week transition period. In a second trial 12 cows were used, with the iodinated casein fed to 3 of them for 13 weeks and 3 for 10 weeks at the rate of about 1.5 gm. for 100 lb live weight. Variations were made later in the dose in accord with the individual response. With the iodinated casein in the reversal trial there were significant increases in milk production and in the percentage of fat. However, in the second trial higher fat tests were shown for the first 6 weeks and increased milk yield for the first 5 weeks, but thereafter control cows were higher in production. There were average increases of 10 and 13 beats per minute in the pulse rate from the use of iodinated casein in the reversal and continuous experiments. Body weight losses in the continuous experiment averaged 32 lb. for the 8 weeks on iodinated casein, whereas the controls gained an average of 36 lb. After 8 weeks weight was constant. Body temperatures was closely coordinated with atmospheric temperature, but those receiving iodinated casein showed higher body temperatures and were more sensitive to atmospheric temperature changes than the control cows.

**A report on the occurrence of rickets in calves under farm conditions, J. W. HIBBS, W. E. KRAUSS, C. F. MONROE, and W. D. POUNDEN.** (*Ohio Expt. Sta.*). (*Jour. Dairy Sci.*, 28 (1945), No. 7, pp. 525-529, illus. 3).—The occurrence is reported of rickets in nine Guernsey calves from 3 to 6 mo. of age. The calves were allowed to nurse their dams for 4 to 6 weeks and then given liberal grain feeding. Although they had access to good quality alfalfa and timothy hay, little was consumed because of heavy consumption of grain. The serum calcium and phosphorus were low and the serum phosphatase was extremely high—typical of rickets. Feeding irradiated yeast brought about improved condition, and after 4 weeks the blood calcium and phosphorus were normal and the phosphatase much reduced. The normal appearance of the cows toward the end of their first lactation indicated that unless rickets is too far advanced the damage to the bones may be corrected. If rickets is advanced before vitamin D administration, skeletal changes become more or less permanent.

**Effect of atmospheric temperature on body temperature and respiration rate of Jersey cattle, R. F. GAALAS.** (*U. S. D. A.*). (*Jour. Dairy Sci.*, 28 (1945), No. 7, pp. 555-563, illus. 2).—In 3,298 individual readings of body temperatures and air temperatures, there was shown to be a definite relation in Jersey cattle. The average body temperature ranged from 101° F. at an average air temperature of 50°, to 103.2° at an average air temperature of 95°, with a value of  $r = +0.57 \pm 0.0079$ . Respiration rate showed about the same relation to air temperature, with a value of  $r = +0.77 \pm 0.0048$ . The average body temperature of Jersey cows was calculated as  $101.1^\circ \pm 0.5^\circ$  F., and the average respiration rate as  $22 \pm 6$  per minute.

**Apparatus for the measurement of the rate of milk-ejection in the dairy cow, W. G. WHITTLESTON** (*New Zeal. Jour. Sci. and Technol.*, 26 (1945), No. 5, Sect. A, pp. 252-257, illus. 4).

This lacteal secretion, F. H. HERZER. (Miss. State Col.). (*Milk Dealer*, 34 (1945), No. 9, pp. 122-126).—The various components of milk and its byproducts include fat and fatlike substances, proteins, amino acids, mineral constituents, pigments, milk sugar, and vitamins, which are listed in detail.

Ascorbic acid oxidation a key factor in the inhibition or promotion of the tallowy flavor in milk, V. N. KRUKOVSKY and E. S. GUTHRIE. (Cornell Univ.). (*Jour. Dairy Sci.*, 28 (1945), No. 8, pp. 565-579, illus. 4).—The oxidation of the ascorbic acid during storage at low temperatures was found to be an essential link in a chain of reactions resulting in the development of tallowy flavor, and the reaction which produces it could be inhibited by quick and complete photochemical or chemical oxidation of ascorbic acid in milk to dehydroascorbic acid prior to its pasteurization and storage. The development of the flavor is stimulated by partial oxidation of ascorbic acid. Copper additions were less effective in promoting tallowy flavor in the presence of dehydroascorbic acid than in milk containing ascorbic acid, and this flavor was not promoted by added copper in milk completely depleted of its ascorbic acid and the subsequent heat treatment of pasteurization. Tallowy flavor could be induced again by the addition of ascorbic acid to milk which was first depleted of its ascorbic acid. A bibliography of 24 references is included.

Off-flavor in milk, W. M. ROBERTS and C. E. WYLIE (*Tennessee Sta. Cir.* 91 (1945), pp. [2]).—Off-flavor of milk and other dairy products, based on the action of lipase, was controlled by heating the milk to 143° F. for 30 min. and immediate cooling to 60° or preferably lower.

The presence in raw milk of a bactericidal substance specific for certain strains of coliform organisms and the comparative rate of growth of bacteria in raw and pasteurised milk, C. S. MORRIS (*Dairy Indus.*, 10 (1945), No. 3, pp. 180-181).—A greater bacterial count of pasteurized than of raw milk from the same sample after incubation for 24 hr. at 18° C. was taken to indicate that bactericidal substances are present in the raw milk which are specific for certain strains of coliform organisms. The possibility of recontamination after pasteurization must be carefully avoided.

A time and equipment comparison between the methylene-blue and direct microscopic tests, K. M. MASON (*Jour. Milk Technol.*, 8 (1945), No. 3, pp. 145-146).—Given the essential equipment and personnel for testing by the methylene-blue reductase test, the additional equipment required for the direct microscopic test would cost approximately \$85. The laboratory time would increase from 4.5 to 10 hr. and the clerical time from 1 to 3 hr. per 100 samples examined.

Accounting for variations in fat tests, W. S. ARBUCKLE. (Tex. A. and M. Col.). (*South. Dairy Prod. Jour.*, 34 (1943), No. 6, pp. 42-44, 47, illus. 1; *abs. in Texas Sta. Cir.* 107 (1944), p. 55).—Satisfactory results were obtained in testing composite samples of milk when stored 10 to 15 days at not more than 60° F. and preserving with 0.2239 gm. of mercuric chloride in each 4-7-oz. sample. Composite samples may test 0.1-0.3 percent lower than the actual test of the milk delivered, due to various causes such as improper handling resulting in churning, melting of the fat, or allowing a portion to dry on the side of the sample jar.

The Babcock fat test on homogenized milk, L. M. LAMPERT and J. H. BRANDON (*Jour. Milk Technol.*, 8 (1945), No. 3, pp. 140-144).—Studies of comparative tests on homogenized milk before and after homogenization at different pressures showed that the regular Babcock procedure was accurate. Homogenized milk preserved with formaldehyde gave a lower Babcock test than unpreserved samples. When mercuric chloride preservation is employed, oiling off or fat separation must be avoided. Neither the Pennsylvania (E. S. R., 86, p. 9) nor the Minnesota test is recommended for homogenized milk.

The influence of milk-fat globule size and milk and cream temperatures on the stability of the frozen cream emulsion, R. W. BELL and C. F. SANDERS. (U. S. D. A.). (*Jour. Dairy Sci.*, 28 (1945), No. 8, pp. 581-589, illus. 1).—The effects of varying conditions on the extent of oiling off of cream after freezing were investigated. Raw and pasteurized 40-percent cream from Holstein milk oiled off less after brief storage than Jersey cream. After freezing and thawing, the pasteurized cream oiled off as much as or more than raw cream. Pasteurized cream from cooled milk of less than average fat content separated at the relatively low temperature of 25° C. The stability of the cream emulsion measured by the amount of oiling off of thawed cream was greatly influenced by the size and number of fat globules and changes in the temperature of the milk and cream and the conditions under which the cream was cooled and frozen. Rapid cooling of the cream to 5°-10° decreased resistance to the destabilized forces of freezing and brief storage more than cooling in 10-30 min. with or without moderate agitation before freezing. Relationships were shown between the viscosity of the cream before freezing and the extent of oiling off afterward.

Substances adsorbed on the fat globules in cream and their relation to churning—V, Composition of the "membrane" and distribution of the adsorbed substances in churning, R. JENNESS and L. S. PALMER. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 8, pp. 611-623).—Continuing this series (E. S. R., 75, p. 248), study was made to determine some of the factors that affect the composition of the membrane of the fat globule and secure quantitative data on the partition of its constituents upon churning. In general, the methods previously employed were utilized with slight modifications. The milk was heated, separated, washed six times, standardized to 30-35 percent fat, and cooled before churning. The protein contents of the fat membrane ranged from 0.46 to 0.86 gm., and the lipide phosphorus contents from 8.9 to 16.3 mg. per 100 gm. of fat. The protein content was lower from Jersey than from Holstein milk. The protein phospholipide ratio varied from 1.8 to 2.4 in 15 samples of washed cream, but was 2.7 in a sixteenth sample. The protein and phospholipide contents and ratios between them were not affected by the fat composition of the feed. In 10 samples of cream, exhibiting only minor variations in fat globule size, the protein and phospholipide contents were 34.0 to 49.0 and 0.57 to 0.86 µg. per 100 sq. cm. of fat surface. The butter serum contained more phospholipides per unit of protein than the buttermilk, but the ratios of protein to phospholipides were not altered by drying. Butter from washed cream retained protein at a rather constant level of 0.21 to 0.30 gm. per 100 gm. of fat regardless of the content of fat or protein in the washed creams from which the butters were made. The list of 19 references gives a rather complete bibliography of the subject.

The mold mycelia count as an index of quality of butter, P. R. ELLIKER and B. E. HORRALL. (Ind. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 7, pp. 519-524, illus. 2).—Mold mycelia counts of 1,385 commercial butter samples showed the expected seasonal variation, with higher counts occurring in the warm months of the year. The organoleptic grade of butter was fairly uniform throughout the various seasons, but slightly more poor-quality butter was manufactured in the fall than in the other seasons. The mold mycelia values did not closely correlate with organoleptic grades over the various seasons of the year. Butter complying with legal standards was more than 50 percent of the cooking grade, almost 75 percent of the 89 score, about 90 percent of the 90 score, and all of the 92 score butter. It appeared that greater improvement might be made in the actual quality of commercial butter if more attention were paid to the organoleptic grade and the determination of the quantity of associated decomposition products and less to the mold content of the cream.

The effect of rusty cream cans upon the quality of butter, F. W. HAMILTON (*Canad. Dairy and Ice Cream Jour.*, 24 (1945), No. 6, pp. 29-32).—Cream stored in rusty cans definitely deteriorated in quality in proportion to the amount of iron exposed. The metallic flavor of cream in rusty cans was increased by greater acidity. The cream was stored at 65° to 70° F. The average scores of eight churnings of butter when fresh and after 2 months' storage from cream in well-tinned cans were 38.4 and 38.1, in slightly rusty cans 37.65 and 37.03, and in definitely rusty cans 36.8 and 35.8, respectively. The parts per million of iron in the cream and butter before and after neutralization were ascertained.

Practical butter manufacture: A manual for buttermakers, G. H. WILSTER (*Corvallis, Oreg.: OSC Coop. Assoc., 1943, 3. ed., rev., pp. 271+, illus. 1*).—Practical information on the manufacturing and handling of butter is given in concise form.

The manufacture of Cheddar cheese from pasteurized milk in commercial plants, H. E. WALTER and H. R. LOCHRY. (U. S. D. A.). (*Jour. Dairy Sci.*, 28 (1945), No. 8, pp. 597-606, illus. 3).—Studies of the method developed by Wilson et al. (E. S. R., 93, p. 189) for making Cheddar cheese from pasteurized milk further demonstrated that a uniformly high percentage of No. 1 cheese can be made from pasteurized milk in commercial plants in Minnesota, Indiana, Missouri, Arkansas, and other States by the use of a suitable amount of an active starter and with the use of a definite time schedule. Such a schedule simplifies cheese making. These results further indicate that a definite relationship exists between the rate of development of acidity during the making process and the quality of the cheese made from pasteurized milk. The range of acidity that should be maintained is shown.

The centrifugal milk clarifier in Cheddar cheese manufacture, E. G. Hoon and I. HLYNKA (*Canad. Dairy and Ice Cream Jour.*, 24 (1945), No. 5, pp. 27-31, illus. 5).—Centrifugal clarification of milk for cheese making removes undesirable sediment, improves the flavor and texture of cheese, and reduces the amount of fat lost in the whey. Typical trials were conducted in seven cheese vats of a commercial plant, with part of the milk clarified and part unclarified.

Influence of incubation at low temperatures on heat resistance of Swiss cheese starter cultures J. G. Voss and W. C. FRAZIER. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 7, pp. 545-553, illus. 4).—In a further study of factors affecting the activity of Swiss cheese starter cultures, by Peppler and Frazier (E. S. R., 85, p. 662), the increased activity of *Lactobacillus bulgaricus* after heat shock in skim milk cultures at 24.3° C. for 84 hr. was in agreement with the findings of the authors referred to on the phenomenon in the growth of *L. helveticus* at 25°. Variation of a few degrees in the incubation temperature makes little difference in the activity of the cells. These results showed that the culture could be readily produced in room temperature without thermostatic control. When heat resistance was measured by survival, cells grown at a temperature near the optimum were the most resistant. The ability of cells of *L. bulgaricus* to grow was decreased by association with *Candida krusei* after heat treatment, but the ability to produce acid was increased. The heat resistance of *Streptococcus thermophilus* was decreased by growth near the minimum temperature when the character was measured by activity or survival after heat shock. The rate of growth of *S. thermophilus* was increased by heat shock. A comprehensive bibliography on the effect of various conditions on the activity and heat resistance of Swiss cheese starters is included.

## VETERINARY MEDICINE

[Contributions on veterinary medicine] (*U. S. Livestock Sanit. Assoc. Rpt.* 48 (1944), pp. 6-220, illus. 9).—Among the contributions presented at the annual meeting held December 6-8, 1944 (E. S. R., 92, p. 557), are the following: Interstate Movement of Livestock From the Viewpoint of the Beef Cattle Breeder, by F. E. Mollin (pp. 6-10); Interstate Health Regulations From the Viewpoint of the Regulatory Official, by C. P. Bishop (pp. 11-14); Interstate Regulations From the Viewpoint of the Dairy Cattle Breeder, by J. S. Clark (pp. 15-17); Second Annual Report of the Inter-Association Council on Animal Disease and Production, by M. Welch (pp. 26-28); The Immunity Created by Vaccination of Calves With *Brucella* Strain, by R. R. Birch, H. L. Gilman, and W. S. Stone (pp. 32-41); Bang's Disease Control From the Viewpoint of the Breeder, by L. V. Wilson (pp. 42-44); Advantages of Breeding Livestock in a Bang's Disease Free State, by K. Scott (pp. 45-47); Report of Cooperative Brucellosis Control Work in the United States, by A. W. Miller, A. E. Wight, and A. B. Crawford (pp. 48-57) (U. S. D. A.); Further Results From Vaccination With Strain 19, by C. M. Haring and J. Traum (pp. 58-62) (Univ. Calif.); Studies on the Allergic Activity of *Brucella abortus*, by E. L. Stubbs (pp. 63-67) (Coop. U. S. D. A.); The Stability of *Brucella abortus* Vaccine Desiccated by Lyophilization, by W. F. Verwey (pp. 68-73); The Control of the Recent Outbreak of Rabies in Maryland, by A. L. Brueckner (pp. 78-81); The History and Administration of Dog Licensing Act and its Value in the Control of Rabies in New Jersey, by J. S. McDaniels et al. (pp. 82-87); The Spread of Anaplasmosis by Contaminated Instruments, by G. W. Stiles (pp. 93-97) (U. S. D. A.); Report of Further Studies of Brucellosis in Swine, by L. M. Hutchings (pp. 105-109) (Ind. Expt. Sta.); Hemorrhagic Dysentery in Swine, by L. P. Doyle (pp. 110-111) (Purdue Univ.); Recent Trends in the Diagnosis of Bovine Trichomoniasis, by B. B. Morgan (pp. 116-120) (Wis. Sta.); Federal Meat Inspection Under Wartime Conditions, by M. R. Clarkson (pp. 128-132) (U. S. D. A.); The Scope of Veterinary Public Health in the Post-War World, by I. A. Merchant (pp. 133-140) (Iowa State Col.); Mastitis Panel (pp. 143-144); The Importance of Group Agglutination in Pulorum Disease Testing Programs, by W. R. Hinshaw and E. McNeil (pp. 165-170) (Univ. Calif.); Blue Comb Disease, by F. F. Waller (pp. 171-176) (N. H. Sta.); Vaccination for Pneumoencephalitis, by J. R. Beach (pp. 177-184) (Univ. Calif.); Avian Monocytosis, So-Called Pullet Disease, by E. Jungiheri and L. D. Matterson (pp. 185-196) ([Conn.] Storrs Sta.); Status of Tuberculosis Control in Los Angeles County During War Time, by L. M. Hurt (pp. 203-205); Bovine Tuberculosis Eradication in Canada, by M. Barker (pp. 206-207); Present Status of Bovine Tuberculosis Eradication Program, by A. E. Wight (pp. 208-211) (U. S. D. A.); and An Analysis of Factors Contributing to the Difficulties of Eradicating Tuberculosis of Poultry and Swine, by H. R. Smith (pp. 212-217).

The committee reports include those on State health requirements governing admission of livestock, by C. P. Bishop et al. (pp. 18-26); parasitic disease, by B. T. Simms et al. (pp. 29-31); Bang's disease, by H. C. Givens et al. (pp. 74-77); rabies, by H. W. Schoening et al. (pp. 88-92); anaplasmosis, by I. S. McAdory et al. (pp. 98-100); miscellaneous transmissible diseases, by L. M. Hurt et al. (pp. 101-109); transmissible diseases of swine, by H. C. H. Kernkamp et al. (pp. 112-113); community auction sales, by F. Carr et al. (pp. 121-124); transmissible diseases of poultry, by H. J. Stapseth et al. (pp. 197-202); and tuberculosis, by W. Feldman et al. (pp. 218-219).

[Miscellaneous papers] (*Cornell Vet.*, 35 (1945), No. 2, pp. 81-87, 103-127, 137-166, illus. 10).—These papers, for the most part presented at the Thirty-seventh

Annual Conference for Veterinarians held at Ithaca, N. Y., on January 4 and 5, 1945, include Mastitis and the Practitioner, by R. C. Klussendorf (pp. 81-87); Enteritis in Swine, by L. P. Doyle (pp. 103-109) (Purdue Univ.); The Immunity Created by Vaccination of Calves With *Brucella abortus* Strain 19, by R. R. Birch, H. L. Gilman, and W. S. Stone (pp. 110-122), Rabies Control, by A. Zeissig (pp. 123-127), and Some Dog Neoplasms, by H. D. Hopper (pp. 137-147) (all Cornell Univ.); The Boynton Gall Bladder Smear for Diagnosing Hog Cholera, by W. L. Sippel (pp. 147-151); Hog Cholera Vaccines, by W. L. Sippel and N. H. Casselberry (pp. 152-157); and Permanently Drying Off Diseased Quarters, by S. D. Johnson (pp. 158-166) (Cornell Univ.).

[Miscellaneous contributions from India] (*Indian Jour. Vet. Sci. and Anim. Husb.*, 14 (1944), No. 2, pp. 100-111, 112-114, 125-132, illus. 3).—These papers include: Tuberculosis in Buffaloes, by P. R. Krishna Iyer (pp. 100-105); Some Observations on "Wah" of Goats and Sheep in Sind, by H. S. Bawa (pp. 105-110); A Case of Tuberculosis in a Sheep, by P. N. Nanda and K. Singh (pp. 110-111); Poisoning of Livestock by *Datura stramonium* L., by N. Das Kehar and K. Govinda Rau (pp. 112-114); and Chemotherapy of Helminthic Infections of Domestic Animals, by G. D. Bhalerao (pp. 125-132).

[Veterinary education in India], M. ABDUSSALAM ET AL. (*Indian Vet. Jour.*, 21 (1945), No. 4, pp. 197-262, illus. 1).—This includes a series of special articles dealing with the history and present status of veterinary education in India, and especially with its future development.

Classification of the phenomena of specific sensitivity in lower animals, C. R. SCHROEDER (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 819, pp. 351-354).—This is a review of studies on anaphylaxis and allergy, with 27 references.

List of parasites of domesticated animals of North America, E. A. BENBROOK Ames, Iowa: Author, 1945, pp. 44).—This list, intended to supplement the lectures and laboratory work of a course in veterinary parasitology, is arranged by systems of organs infested in the domesticated animals of North America north of Mexico.

Zooparasites in relation to production of meat and other animal products in wartime, B. SCHWARTZ. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 819, pp. 331-335).—This is a brief review of the role of zooparasites in the production of meat, fiber, and other animal products, including suggestions for their control.

The action of three different bacon-brines on pathogenic bacteria, A. GINSBERG (*Vet. Jour.*, 101 (1945), No. 6, pp. 123-131, illus. 5).—A special study of three brines, used in the curing of bacon, was made in which a commercial pickle with a salt concentration of 24 to 26 percent and an average pH of 7.1 was compared with this brine plus 0.5 percent of borax and a brine in which the saltpeter had been replaced by 0.6 percent of sodium nitrite. Tests were carried out with suspensions of the most common "meat-poisoning" bacteria, both in the pure brine and inoculated with meats cured from 2 to 21 days. Results with *Staphylococcus aureus*, *Bacterium typhi murium*, *B. enteritidis gaertner*, *Salmonella reading*, *Proteus vulgaris*, and *Chromobacterium prodigiosum* indicated that pickling is ineffective as a means of rendering infected meat fit for human consumption because of its slight and uncertain disinfectant effect on pathogenic action and the length of time required for killing meat-poisoning organisms. Sodium nitrite mixed with common salt and sugar is recommended as a means of shortening the curing process of sound meat.

Epizootiology of western equine type encephalomyelitis: Eastern Nebraska field survey of 1943 with isolation of the virus from mosquitoes, W. W. HAMMON, W. C. REEVES, and P. GALINDO. (Univ. Calif. et al.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 145-148).—In this survey, the western type encephalomyelitis virus was isolated only from *Culex tarsalis* mosquitoes, although no evidence was

found of past infection in the blood of chickens or pheasants. See also a previous note (E. S. R., 88, p. 816).

[Notes on *Salmonella* and related organisms] (*Jour. Bact.*, 49 (1945), No. 5, pp. 511, 513-515, 516-518).—These notes include A New Type *Salmonella*, by C. C. Randall and D. W. Bruner (p. 511), dealing with *S. canastel*, with a diagnostic formula of IX, XII . . . : z<sub>21</sub>-1, 3, 5 . . . ; A Paracolonlike Bacillus Isolated from Colitis in an Infant, by P. R. Edwards (pp. 513-514) (*Ky. Expt. Sta.*) ; A New *Salmonella* Type: *Salmonella papuana*, by K. S. Wilcox, P. R. Edwards, and M. Coates (pp. 514-515) (*Ky. Expt. Sta. et al.*), dealing with a new type with the antigenic formula VI, VI<sub>s</sub>, VII . . . : r; enz<sub>18</sub> . . . ; Triple-Sugar Iron Agar Medium for the Identification of the Intestinal Group of Bacteria, by A. A. Hajna (pp. 516-517); and *Salmonella* Types Isolated in Maryland Between 1936 and 1943, by A. A. Hajna and C. A. Perry (p. 518).

Form variation in group C *Salmonella* strains, P. R. EDWARDS. (*Ky. Expt. Sta.*). (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 1, pp. 49-52).—Antigen VI<sub>s</sub> was found to be subject to a reversible form variation in both the *S. choleraesuis* and *S. newport* groups. Colonies deficient in VI<sub>s</sub> had a normal content of VI<sub>s</sub>, which apparently is not subject to form variation.

Isolation of *Salmonella rubislaw* from a water supply, R. W. NEWMAN (*Calif. Dept. Agr. Bul.*, 34 (1945), No. 2, pp. 95-97).—A report of typhoid fever which seemed to implicate raw milk led to the finding in a dairy water supply of isolates identified by P. R. Edwards as *S. rubislaw*.

Nutrition of the host and natural resistance to infection.—I. The effect of diet on the response of several genotypes of *Mus musculus* to *Salmonella enteritidis* infection, H. A. SCHNEIDER and L. T. WEBSTER (*Jour. Expt. Med.*, 81 (1945), No. 4, pp. 359-384, illus. 3).—In these studies of the relation of nutrition to resistance to infection, a diet of whole wheat and whole dried milk was found to promote a higher survival rate among W-Swiss mice subjected to *S. enteritidis* infection than was promoted by a modified Steenbock synthetic diet. This ability of diet to condition natural resistance, however, was found to depend upon the genetic constitution of the mice employed, and was not possible of demonstration in three highly bred strains of mice so selected that they differed predictably from one another in natural resistance.

An outbreak of *Salmonella* infection in man from infected chicken eggs, J. WATT (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 29, pp. 835-839).—An outbreak of salmonellosis (*S. montevideo*) aboard a merchant vessel, affecting 28 individuals in a crew of 70, is reported. Epidemiological evidence indicated that infection resulted from the consumption of contaminated egg salad, the mayonnaise of which contained raw eggs. *S. montevideo* was isolated from two cases of shell eggs obtained on the ship. Internal contamination of the eggs was demonstrated, since the shell washings before sterilization were free of *S. montevideo*, and the egg meats obtained after sterilization of shells were found to contain this organism.

A case of food poisoning in man probably caused by the consumption of a duck egg, R. F. GORDON and A. BUXTON (*Vet. Jour.*, 101 (1945), No. 6, pp. 131-135).—*Bacterium typhi-murium* was isolated from the blood and feces of a patient who died of gastroenteritis following the consumption of a fried duck egg. A fortnight later, agglutinins to *B. typhimurium* were found in the sera of 3 of the 4 ducks composing the flock from which the egg was obtained; the serum of the fourth duck became positive after a further 4 mo. *B. typhi-murium* was cultured from the yolk and shell of 3 of the 16 eggs laid by these 4 ducks, and the same organism was isolated from the ovary of the 2 ducks which laid the infected eggs, as well as from the intestinal tract of a third duck.

**Chemotherapeutic testing in experimental tuberculosis.** W. H. FELDMAN and H. C. HINSHAW (*Amer. Rev. Tuber.*, 51 (1945), No. 6, pp. 582-591, illus. 2; *Span. abs.*, p. 591).—A suggested outline of laboratory procedures for testing antituberculosis substances in experimentally infected animals is presented and discussed.

**The susceptibility of the golden hamster (*Cricetus auratus*) to tularemia.** C. L. LARSON (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 29, pp. 839-841).—The susceptibility of hamsters to tularemia was found to approximate that of white mice. They are equally susceptible to subcutaneous and to intraperitoneal inoculation.

**Some poisonous plant problems of New Mexico.** A. L. HERSHIY (*New Mexico Sta. Bul.* 322 (1945), pp. 23, illus. 8).—This is a preliminary report, discussing why some plants are poisonous, why animals eat poisonous plants, proper range management, and specific forms of poisoning, including those from hydrocyanic acid, bighead or photosensitization, oxalates and nitrates, selenium, and mustard.

**Durango root (*Datiscia glomerata*) poisoning of range stock.** K. A. WAGNON and G. H. HART. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 820, pp. 3-5, illus. 1).—Toxicity tests with cattle and sheep, using the dried leaves, seeds, and seed capsules of durango root, showed that these materials were definitely toxic. Sublethal doses resulted in diarrhea, loss of appetite, and general depression. An intake of 250 to 275 gm. of dry leaves and seed capsules proved lethal to a 21-month-old heifer and a heifer calf. Great difficulty was encountered in inducing sheep to eat the plant, and it is thought to be doubtful if it has been the cause of any great number of cattle losses. However, "it has, undoubtedly, been one cause of undiagnosed losses among cattle in the Sierra foothills."

**Nitrite poisoning from ingestion of plants high in nitrate.** C. W. RIGGS. (Utah Expt. Sta.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 194-197).—Several widely separated turkey flocks were reported as afflicted with nitrite poisoning following a drought-breaking rainfall. Experiments were conducted in which approximately half the nitrate in dry oat hay moistened with water was reduced to nitrite and was present as such after 20 hr. It is suggested that poisoning associated with the ingestion of high-nitrate hays following rain may be caused by the nitrite produced in the hay.

**Selenium poisoning in livestock.** E. P. PAINTER. (N. Dak. Agr. Col.). (*M. S. C. [Mich. State Col.] Vet.*, 5 (1944), No. 1, pp. 9-15, illus. 3).—This brief review discusses seleniferous areas, gross symptoms, post-mortem findings, susceptibility, and means of protection.

**Standardization of streptomycin.** S. A. WAKSMAN. (N. J. Expt. Stas.). (*Science*, 102 (1945), No. 2637, pp. 40-41).—Three units for designating streptomycin are proposed. These are:

"(1) An S unit, or that amount of material which will inhibit the growth of a standard strain of *E[scherichia] coli* in 1 cc. of nutrient broth or other suitable medium. This unit will thus correspond to the original *E. coli* unit.

"(2) An L unit, or that amount of material which will inhibit the growth of a standard strain of *E. coli* in 1 l. of medium. An L unit is thus equivalent to 1,000 S units.

"(3) When crystalline material becomes available, a weight unit will become possible. One can even now prepare for it by recognizing a G unit, comparable to 1 gm. of the crystalline material. Should this material show an activity of 1,000 *E. coli* units per 1 mg., it will be equivalent to 1,000,000 S units, to 1,000 L units, and to 1 G unit per gram of material."

***Brucella abortus* isolated from aborted fetuses of vaccinated heifers.** D. L. KERLIN and R. GRAHAM. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc.*, 106 (1945), No. 819, pp. 356-357).—An unusual outbreak of abortion in 13 out of 35 Angus heifers of unknown brucellosis status when vaccinated with strain 19 is

described. Two of the six aborted fetuses examined yielded *B. abortus*. It is concluded that "in herds where calfhood vaccination is adopted, the health status of the herd, as well as that of the calves, with reference to brucellosis both before and after vaccination and at breeding age, should be determined if the highest potential value of vaccination is to be realized in the control of bovine brucellosis."

**Chemotherapy in the treatment of chronic contagious mastitis,** [I], II, R. W. ROACH and S. L. HICNETT (*Vet. Jour.*, 101 (1945), Nos. 4, pp. 88-94; 5, pp. 99-108, illus. 3)—Following an extensive review of the literature, the authors discuss the technic of drug administration and report results of extended chemotherapeutic trials, mostly with Ayrshire cattle. In spite of a very low percentage of bacteriological cures, "in nearly every instance at least 50 percent of the cases benefited by the adoption of chemotherapy in the treatment of *Streptococcus agalactiae* mastitis."

**Treatment of bovine mastitis with penicillin,** L. W. SLANETZ and F. E. ALLEN. (N. H. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 820, pp. 18-20).—Results are reported of studies in which 33 cows and 59 quarters with streptococcal mastitis were treated with penicillin (sodium salt). Of these 31 cows and 55 quarters were cured by a single treatment, and 1 cow on re-treatment. Eight cows and 14 quarters were treated for staphylococcal mastitis, of which 6 cows and 11 quarters were cured.

It is concluded that "penicillin is highly effective in bovine mastitis. Streptococcal mastitis may be cured by one injection of 100,000 Oxford units of penicillin administered in 100 cc. of sterile saline or distilled water via the teat canal. In more acute cases or cases of long-standing, chronic infection, one or more injections containing 200,000 units may be necessary. Staphylococcal mastitis is more difficult to cure and may require one or more treatments with 200,000 Oxford units of penicillin per 100-cc. dose."

**The value of local injections of penicillin sodium in the treatment of *Streptococcus agalactiae* infection and mastitis in cows,** J. M. MURPHY and K. O. PFAU. (N. J. Expt. Stas.). (*Cornell Vet.*, 35 (1945), No. 2, pp. 88-103, illus. 2).—Fifty-two quarters of 19 cows from the station experimental herd, infected with *S. agalactiae* but otherwise unselected, were treated with penicillin sodium in boiled distilled water via the teat canal.

In experiment 1, 15 quarters of 5 cows were treated with single injections of 5,000-200,000 Oxford units in 50-300 cc. of water. Five of the quarters were freed of their infection. Seven quarters of 3 cows whose infection had resisted a single dose of penicillin were retreated with a single injection of comparable or slightly greater amount 2 to 4 weeks later. None of the 7 quarters was freed of its infection as the result of re-treatment.

In experiment 2, 10 quarters of 4 cows were treated with 5 doses of 10,000 units at milking intervals; total dose 50,000 units per quarter. Six of the 10 quarters were freed of their infection. The effectiveness of the treatment did not appear to be dependent upon the lactation period, the week of lactation, the duration of the infection prior to treatment, the degree of induration present at the time of treatment, or the degree of macroscopic alteration of the secretion present at the time of treatment.

In experiment 3, 32 quarters of 13 cows (of which 4 quarters of 2 cows were the uncured quarters of experiment 2, and of which 1 quarter had been cured in experiment 2 and had subsequently become reinfected) were treated with 5 doses of 20,000 units at milking intervals: total dose 100,000 units per quarter. All quarters were freed of their infection, regardless of the lactation period or week of lactation at which treatment took place, or the pretreatment status of the quarter with regard to the duration of the infection, the degree of induration of the quarter, or the degree of macroscopic abnormality of the secretion. In the dosage used

and by the method of administration employed, penicillin sodium was found to be only slightly toxic for the mammary gland in that no direct signs of tissue damage were observed. There was only slight transitory macroscopic alteration of the secretion and no adverse effect upon the volume of milk production.

**Non-permeability of the lactating bovine mammary gland to penicillin**, H. W. SEELEY, JR., E. O. ANDERSON, W. N. PLASTRIDGE, and P. PEARSON. ([Conn.] Storrs Expt. Sta.). (*Science*, 102 (1945), No. 2637, pp. 44-45).—When the milk of a Jersey heifer, free of mastitis, was tested for penicillin activity following intravenous injections of 80,000 and 500,000 Oxford units of a calcium salt of penicillin, no activity was observed in any of the milk samples obtained in either of the ensuing 24-hr. periods. No supporting evidence was found as to the value of the intravenous method for the treatment of chronic bovine mastitis with penicillin, and it was indicated that the lactating bovine mammary gland does not serve as a major systemic exit for penicillin in the blood. See also a note by Bryan et al. (E. S. R., 93, p. 73).

**Some information on anaplasmosis for the veterinarian**, W. H. BOYNTON and G. M. WOODS. (Univ. Calif.). (*M. S. C. [Mich. State Col.] Vet.*, 5 (1944), No. 1, pp. 25-32).—A review discussing the nature of the infecting agent, transmission, diagnosis, anatomical changes, and treatment.

**Hemoglobin tests on 175 cases anaplasmosis**, H. C. SMITH and D. E. HOWELL. (Okla. Expt. Sta.). (*Vet. Med.*, 40 (1945), No. 8, pp. 272-273, illus. 1).—Studies of 175 field cases on the range indicated that the concentration of hemoglobin is a valuable clinical index to the probable outcome of the disease. Animals having less than 30 percent of the normal amount of hemoglobin in the blood are thought to have little chance of survival under ordinary conditions.

**Blood transfusion as a treatment for anaplasmosis**, H. C. SMITH and D. E. HOWELL. (Okla. Expt. Sta.). (*Vet. Med.*, 40 (1945), No. 7, pp. 228-230).—Intravenous injections of from 2,000 to 3,000 cc. of citrated blood obtained from a dairy herd resulted in the recovery from anaplasmosis of 15 out of 16 animals deemed possible of salvage.

**A study of bovine infectious keratitis**, E. M. BALDWIN, JR. (Ohio Expt. Sta.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 180-187).—This disease, sometimes referred to as "pinkeye," is characterized by an acute inflammation of the eyeball and surrounding tissues, and affects cattle of all ages and breeds. Although of low mortality, it is regarded as of considerable economic importance. Dairy cattle may drop 25 percent or more in milk production, and young beef cattle may fail to gain or even lose weight. Bacteriological studies as to its etiology were carried on with samples from 62 cattle from 13 herds in central Ohio, where the infection involved 50 to 90 percent of the herds. Samples were also obtained from California and Montana.

***Hemophilus bovis*** was indicated as the probable cause of the disease, being found in 93 of 112 infected eyes examined and in no eye of 20 normal cattle. Cultures inoculated into the conjunctival sac produced an infection indistinguishable from infectious keratitis in one or both eyes of 12 of 15 animals, and persisted for two or more months even after apparently complete recovery. Sheep, mice, guinea pigs, and rabbits were not found to be susceptible.

**Poikilocytosis in dairy cattle**, J. T. REID, C. F. HUFFMAN, and C. W. DUNCAN. (Mich. Expt. Sta.). (*Arch. Pathol.*, 39 (1945), No. 6, pp. 351-357, illus. 3).—Dairy cattle ranging from young calves to mature cows were used in a study of the occurrence and the symptoms of poikilocytosis. In the 233 affected animals, the distribution of poikilocytes varied up to more than 91 percent of the red corpuscles. A standard normal shape of the erythrocytes was established, and it was concluded that the possibility of confusing the poikilocytes with the artefacts produced in crenation is negligible.

The symptoms manifested by the animals with severe poikilocytosis were anorexia, thinness, unthriftiness, a dry and harsh condition of the hair coat, and, in young animals, a retarded rate of growth. Depraved appetite was frequently observed.

The occurrence of poikilocytosis in dairy cattle was found to be independent of the hemoglobin content, the number and volume of red blood cells, and the calcium, inorganic phosphorus, and magnesium contents of the blood. The observation that some entire herds were unaffected is thought to indicate that the presence of poikilocytes in the blood was to a large extent attributable to some nutritional deficiency.

**Phenothiazine-salt mixtures for the control of gasto-intestinal parasites of beef cattle on pasture**, P. D. HARWOOD, J. E. GUTHRIE, and N. A. PREBLE (*Jour. Tenn. Acad. Sci.*, 20 (1945), No. 2, pp. 159-173, illus. 2).—In 1943, a herd of 13 purebred Hereford steers which were placed on the south half of the 30-acre pasture in Ashland, Ohio, were given as their sole source of salt a mixture containing 1 part of phenothiazine and 10 parts of salt. The progress of this herd was compared with progress of a control herd of 12 similar cattle on the north half of the same pasture as regards fecal egg counts and gain in live weight of the steers. In 1944, the experiment was repeated using 14 grade Hereford steers on the north half of the pasture, with the 15 control animals on the south half.

In 1943, the mean egg count of the treated herd fell from 90.2 to 7.6 eggs per gram of feces, while similar counts for the control herd fell from 72.3 to 27.9. In 1944, the mean egg count of the treated herd fell from 38.1 to 5.1 eggs per gram, while similar counts on the control herd fell from 34.4 to 17.0 eggs per gram. These differences were statistically significant.

The treated herd gained 20.5 lb. more per head on the average than the control herd in 1943 and 15.3 lb. in 1944. These differences in the mean gains were deemed highly significant. The animals were lightly infected, however, and differential gains were obtained in herds where no animal, either treated or control, suffered from clinical parasitism.

The major part of the phenothiazine-salt mixtures were consumed in early summer while the pasturage was still very succulent. During this season the mean daily consumption was more than 0.5 gm. of phenothiazine per 100 lb. body weight. The presence of phenothiazine in the salt reduced the salt consumption, especially when the forage was dry and mature. However, the records of gains in weight and the hemoglobin levels in these animals indicated that neither the reduced salt intake nor the amount of drug consumed was in any way harmful.

**Bacillary hemoglobinuria of cattle and sheep (red water disease)**, E. RECORDS and L. R. VAWTER (*Nevada Sta. Bul.* 173 (1945), pp. 48, illus. 14).—This comprehensive summary of investigations at the station extending over 30 yr. takes up in turn the characterization and distribution, clinical symptoms, differential diagnosis, post-mortem lesions, histopathology, physiopathological basis for symptoms and lesions, etiology and bacteriology, pathogenicity of its immediate cause (*Clostridium hemolyticum*), as previously noted (E. S. R., 54, p. 677), treatment, immunization, and the production of a potent, antitoxic antiserum which has proved to be the only adequate clinical treatment. An appendix describes the culture media for pathogenic sporulating anaerobes for the genus *Clostridium*, and gives a bibliography of 62 titles.

**Vibrio fetus in sheep**, J. F. RYFF and A. M. LEE. (Wyo. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 149-158, illus. 1).—*V. fetus* was isolated from aborted lambs from two flocks, and it is concluded that enough work has been done to incriminate it "as a cause of abortion in ewes, although the uncertainty of infection following experimental oral inoculation would indicate a variation in susceptibility." A great difference in ease of cultivation was encountered in different strains

Control of intestinal parasitism in lambs by winter treatment of ewes, as compared with the use of phenothiazine in salt in summer, L. SEGIETTI and H. MARSH. (Mont. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 159-164, illus. 2).—Two treatments of 55 ewes with phenothiazine on January 22 and March 31 failed to result in a lower load in May, as indicated by fecal egg counts, of *Trichostrongylus*, *Ostertagia*, and *Nematodirus*, than in a like number of untreated controls. The numbers were subclinical, and it is concluded that this winter treatment will not pay on a range where sheep will take salt freely during the spring and summer. From the beginning of lambing on April 6, all sheep had access to salt containing 10 percent of phenothiazine, and the average daily consumption of the drug by the ewes and lambs was 0.8 gm. per head. It is believed that this rate will not only prevent clinical nematode parasitism in the lambs but will reduce worm numbers to a minimum in the ewes.

Weekly "salting" with phenothiazine to control parasites, R. T. HABERMANN. (U. S. D. A.). (*Vet. Med.*, 40 (1945), No. 7, pp. 231-234).—Observations on 14 goats and 28 kids covering a period from April 27, 1943, to September 16, 1944, indicated that a 1 : 7 mixture of phenothiazine and salt, with some grain and offered each week, possesses promise of being a practicable procedure for controlling the internal parasites of goats, and possibly of being effective in controlling gastrointestinal parasites of both goats and sheep on the range.

Comparative susceptibility of molluscs to invasion by larvae of nematodes, causative agents of pulmonary helminthoses in sheep and goat, E. A. DAVTJAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 46 (1945), No. 4, pp. 86-87).—An examination was made of 33,338 individuals belonging to 38 species and 12 families of mollusks as to the degree of their infestation by *Müllerius capillaris*, *Cystocaulus nigrescens*, and *Synthetocaulus* spp. under natural conditions in the Armenian Soviet Republic. A total of 45,836 mollusks belonging to 51 species and 14 families were also examined as to their susceptibility to invasion by these species of nematodes when infested artificially. Results of the findings are reported, and four categories are set up for the various mollusk species on the basis of susceptibility.

Tests with fluorides, especially sodium fluoride, as anthelmintics for swine, R. T. HABERMANN, F. D. ENZIE, and A. O. FOSTER. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 131-144).—Anthelmintic and toxicity tests with sodium fluoride, sodium fluoride in combination with phenothiazine, and five other inorganic fluorides were carried out on 151 pigs, 7 goats, 5 sheep, 1 bull, 7 horses, 2 dogs, and 2 chickens.

When given to swine as a 1 percent mixture of the feed for 3 consecutive days, sodium fluoride was very effective against large roundworms, but of variable or insignificant efficacy against stomach worms, nodular worms, and whipworms. Feeding at this rate seemed to represent a reasonably close approximation to the optimum dosage. "It cannot be emphasized too strongly, however, that much further investigation will be necessary before sodium fluoride, however, administered, can be endorsed as a safe and suitable anthelmintic."

In trials with 17 pigs, phenothiazine and sodium fluoride in ratios of 1, 1.4, 2, and 3 parts of the latter to 1 part of the former, were tested at rates of 1.2 to 2.0 percent of the feed. These treatments were 100 percent effective against ascarids, and were well tolerated. The efficacy against nodular worms was only 42 percent, and feeds containing both chemicals in combination were unpalatable. Attempts to mitigate this condition by incorporating various amounts of molasses or sour whey into the feed mixtures were to no avail. The ascaricidal action was complete in all instances, but the addition of sufficient phenothiazine for significant anthelmintic action against nodular worms apparently rendered the mixture markedly unpalatable.

table. Other fluorides, viz., aluminum silicofluoride, 2 percent; barium fluoride, 3 percent and 2 percent for 2 days; aluminum fluoride, 1.5 and 3 percent; sodium aluminum fluoride, 2.5, 5, and 10 percent; and sodium silicofluoride, 1, 2, and 5 percent, fed for 1 day except as mentioned, at the percentages indicated, showed from poor to moderate anthelmintic action or none at all.

Results with sodium fluoride administered to other farm animals indicated that this chemical was sufficiently well tolerated to preclude, for practical purposes, the possibility of accidentally poisoning stock under the same conditions in which it might be used as an anthelmintic for hogs. These tests suggested also that the chemical has some anthelmintic action against ascarids and oxyurids in horses.

**Clinical use of penicillin strangles of horses,** W. K. SELTMER. (Okla. A. and M. Col.). (*Vet. Med.*, 40 (1945), No. 7, pp. 226-227).—Ten horses with typical cases of strangles of different degrees of severity were treated with the calcium salt of penicillin. Six recovered completely, while four showed marked improvement but relapsed 24 to 48 hr following treatment. Swelling occurred at the point of injection when the penicillin was diluted with sterile, distilled water, but not with physiological saline as the diluent.

**Index of diagnosis (clinical and radiological) for the canine, and feline surgeon, with treatment, II.** KIRK (London: Balliere, Tindall & Cox, 1945, 2. ed., pp. 587+, illus. 302).—In this revision (E. S. R., 82, p. 108) several sections are enlarged and new subject matter added.

**The pathology of experimental choline deficiency in dogs,** F. R. DUTRA and J. M. McKIBBIN (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 4, pp. 301-306, illus. 1).—This is a study of the lesions found in weanling puppies following a choline-deficient diet in which the chief source of protein was peanut meal. There were found fatty metamorphosis (degeneration and infiltration) of the liver and atropic changes of the thymus. The ratio of gross liver weight to body weight did not correlate with the choline content of the diet. The kidneys, and the other tissues examined of the choline-deficient puppies were not morphologically abnormal. The morphologic changes in the liver correlated with impairment in liver function, and supported growth and functional data showing that the choline requirement of the puppy is between 50 and 100 mg. of choline per 100 gm. of the ration used. Control animals fed identical rations supplemented with sufficient choline or methionine were normal in all respects.

**Experimental vaccination for prevention of the avian leucosis complex,** E. P. JOHNSON. (Va. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 198-203).—Data are summarized from experiments on the preparation and use of several vaccines to determine their value in the prevention of the avian leucosis complex. It is suggested that the limited work done on the use of frozen, desiccated Beltsville strain A virus is encouraging and should be expanded.

**Chick rearing, II, IV,** T. BARTON MANN (*Jour. Agr. Sci. [England]*, 35 (1945), No. 2, pp. 98-100, illus. 5; pp. 108-115, illus. 4).

**II. The bacterial syndrome arising from a diet which is conducive to six-day disease.**—A bacteriological examination of 26 chicks dying while on a ration conducive to the development of six-day disease showed a blood and tissue syndrome by heterogeneous bacteria, the most prominent being *Clostridium* of the *welchii* type, with the frequent presence of fecal organisms of the coliform and enterococci groups.

**IV. The mechanism of infection in six-day disease with special reference to intestinal putrefaction.**—Feeding tests are reported from which the conclusion is drawn that "six-day disease of chicks is a disease of intestinal putrefaction, and may be fostered by any ration which contains the following: (1) Animal proteins which show evidence of putrefaction, (2) excess of fiber, or spongeliike fiber such as palm-

kernel meal or sugar beet pulp, which assists in the proliferation of putrefactive microbes, (3) residual oils which destroy vitamin A, (4) starch or carbohydrate insufficient to maintain an acid reaction to the lower end of the intestines."

It is further pointed out that the disease produces high mortality, anemia, and other secondary complaints which may not be eliminated by reversion to a nonputrefactive diet.

**Studies on certain filtrable viruses.**—**VIII, Viability of chicken embryo fowl pox virus**, D. L. KERLIN and R. GRAHAM. (Univ. Ill.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 204-207).—Continuing this series (E. S. R., 92, p. 706), the duration of viability of chicken-embryo fowl-pox virus, suspended in different diluents, and results of field experiments on production of immunity by inoculation of farm flocks with chicken-embryo fowl-pox virus suspended in mineral oil, are reported. Duration of viability of chorioallantoic virus varied from time of preparation when suspended in pure glycerin or thioglycollate broth with phenol to at least 13 mo. when suspended in mineral oil or buffered mineral oil. Entire embryo virus showed viability of from 5 to 6 mo. in mineral oil or buffered mineral oil. Inoculation of 15,609 chickens with chicken-embryo fowl-pox virus, including chorioallantoic virus and entire embryo virus suspended in mineral oil, resulted in 93.4 percent takes. When 418 birds from two of the seven flocks were selected for artificial exposure, 96.14 percent resisted.

**Morphology of the cysticercoïd of the fowl tapeworm**, Raillietina cesticillus (Molin), C. L. WISSEMAN, JR. (Kans. Expt. Sta.). (*Amer. Microsc. Soc. Trans.*, 64 (1945), No. 2, pp. 145-150, illus. 13).—Immature stages of these cysticercoïds were obtained from the body cavities of ground beetles collected in regions away from poultry yards and fed gravid proglottids of the tapeworm *R. cesticillus*. The morphological observations reported supplement those of Reid, Ackert, and Case (E. S. R., 80, p. 237).

**Zinc phosphide poisoning in poultry**, J. D. BLAXLAND and R. F. GORDON (*Vet. Jour.*, 101 (1945), No. 5, pp. 108-110).—Zinc phosphide, recently introduced as a vermin poison, is reported to be extremely toxic to poultry, with a minimum lethal dose of approximately 1 grain for a 5-lb. bird. Its differentiation from poisoning with phosphorus, arsenic, and cacao residues is described. The most characteristic finding was a strong odor of phosphine from the crop and gizzard contents. See also a note by Hare and Orr (E. S. R., 92, p. 706).

**Sulfaquinoxaline in preventing upper respiratory infection of chickens inoculated with infective field material containing *Pasteurella avicida***, J. P. DELAPLANE. (Tex. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 207-208).—Results obtained with six experimental groups of chicks are summarized to show that sulfaquinoxaline would seem to offer possibilities in the prevention of enzoötic *Pasteurella* infections of the respiratory tract of chickens, providing further studies show that when given at the levels cited it is not injurious to the bird or is less injurious than the disease would be if all birds of a flock became affected. Preliminary experiments did not indicate that it has any recognizable curative properties.

**Toxicity of high dosages of thiourea alone and thiourea plus colloidal sulfur when fed to baby chicks**, E. P. REINEKE and C. W. TURNER. (Mo. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 4, pp. 340-343).—Continuing studies by Mixner, Reinecke, and Turner (E. S. R., 91, p. 672), groups of White Plymouth Rock chicks receiving, from hatching, 0.5 and 1 percent of thiourea added to a basal mash showed, whether or not similar amounts of colloidal sulfur were included, a high mortality beginning the third day of treatment and becoming 100 percent in three lots in two weeks. All of the birds in the fourth group receiving the smaller amount of thiourea had died by the eighteenth day. Only one of the normal controls died

during this period. There were five lots of about 20 chicks in the experiment. A third test was conducted similarly with 2-week-old chicks to observe the toxicity of these products in older birds. The mortality was similar.

**Polycythemia produced by cobalt in the duck: A hematologic and pathologic study.** J. E. DAVIS, A. W. McCULLOUGH, and R. H. RIGDON. (Univ. Ark.). (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 4, pp. 327-336, illus. 5).—This is a hematologic and pathologic study in which White Pekin ducks 3 weeks of age were given subcutaneous injections of from 1 to 4 mg. of cobalt as cobaltous chloride in 2 percent aqueous solutions. A polycythemia was produced accompanied by early marrow hyperplasia and an increase in extramedullary erythropoietic masses in the spleen, liver, kidney, and suprarenal. With continued injection of cobaltous chloride, there was evidence of marrow hypoplasia, disappearance of extramedullary erythropoietic foci, and a lowered phagocytic activity of the reticulo-endothelial elements of the spleen and the liver.

As previously noted by Rigdon,<sup>1</sup> ducks infected with *Plasmodium lophurae* showed a hyperactivity of the cells in the femur marrow and also of those in the extra-medullary erythropoietic foci.

**The occurrence of Haemoproteus sp. in the domesticated turkey.** N. F. MOREHOUSE (*Amer. Micros. Soc. Trans.*, 64 (1945), No. 2, pp. 109-111, illus. 2).—Heavy parasitization by a hematozoon of a half-grown poult received from Texas from a flock described as having "just wasted away" is reported. The parasite is described as belonging to the genus *Haemoproteus*, apparently not previously associated with turkeys, and believed to represent an undescribed species.

**A new virus disease of pigeons.—I. Recovery of the virus.** J. E. SMADEL, E. B. JACKSON, and J. W. HARTRAN (*Jour. Expt. Med.* 81 (1945), No. 4, pp. 385-398+, illus. 6).—A virus has been isolated from the tissues of a pigeon with visceral lesions that were characterized by focal necrosis of parenchymatous tissue, by the presence in affected cells of intranuclear inclusions of the herpetic type, and by secondary inflammatory reaction. This newly recognized virus, which has been tentatively called the "I. N. I." agent, is pathogenic for pigeons and embryonated eggs but is avirulent for rabbits, guinea pigs, and mice. The virus is smaller than the agent of psittacosis and is immunologically different from it. The I. N. I. agent and psittacosis virus were both of etiological importance in an epizootic among Army pigeons. Some birds were infected simultaneously with the two agents while others were infected with only one.

## AGRICULTURAL ENGINEERING

**Water policy in relation to western agriculture.** C. R. WICKARD. (U. S. D. A.). (*Jyr. Engn.*, 26 (1945), No. 4, pp. 141-144, illus. 4).—Two fundamental principles underlie the Department's water policy for the West, one that the ultimate goal of every irrigation project must be the welfare of the families who make their homes on the land, and the other that a water policy, to be fully effective, must be part of a comprehensive policy for wise use of all of the Nation's natural resources. The Department with its definite responsibility for production of crops and livestock and for measures to prevent erosion and reduce flooding of agricultural land, shares the responsibility for the development, control, and use of the national water resources, and is deeply interested in other uses of water such as the production of electric power and improved navigation that affect farm living and the handling of farm products. Basically, the Department's water policy aims at the fullest and wisest use of water by the people immediately affected, with due regard for the present and long-range interests of all agriculture and of the Nation as a whole.

<sup>1</sup> Amer. Jour. Trop. Med., 24 (1944), No. 6, pp. 371-377, illus. 7.

The development and use of water resources is largely a problem of farm management. The Department has the responsibility for helping all farmers who require assistance in this field. The Agricultural Adjustment Agency makes payments to help farmers build small stockponds, dams, and reservoirs. The Farm Security Administration, through the water facilities program, provides loans and technical assistance to individual and small groups of farmers in the arid and semi-arid areas for developing and utilizing water. The Soil Conservation Service, through its technical assistance to farmers in soil conservation districts, has done much to stimulate better use of water and land. The Forest Service is maintaining and improving the watersheds.

In large-scale operations, where responsibility for the engineering works to bring water to the land rests with other agencies, the Department has definite and long-range responsibility for the farms and the people, and its operating policies have been shaped to fit three major types of situations. On irrigation and other water projects already in existence, it is the Department's job to do everything in its power to help farm people make the best use of the available water. On irrigation projects of various agencies that have been authorized but construction of which is either incomplete or not yet begun, the over-all responsibility of the Department is similar, since the water will be brought to the land. The Department expects to help farmers make the best use of it through the approaches already outlined, but may go further by contributing its full share to the research and planning that is necessary to assure maximum benefits. As to new projects, either those under discussion but not yet authorized or those to be proposed in the future, the Department believes that top priority should go to projects for bringing supplemental water to areas that already are being farmed but have inadequate supplies. The Department is in favor of bringing new land into production when it is suited to agricultural use and when its cultivation offers irrigation farmers a reasonable prospect of success and appears to be in the national interest. The Department feels that it should participate in making these basic determinations. Total production is by no means the only consideration, as there will be marked differences in demand among various products, the type of production for which irrigable land is suited will be of great importance, and national requirements are not always the only criterion, since regional requirements can also be significant. In estimating how much farm land will be needed, it cannot be assumed that all now in use will stay in production, since some land should be put to less intensive use. Each water project can realize its fullest possibilities only through integration with the total agricultural pattern.

**Ground water supplies for rice irrigation in the Grand Prairie Region, Arkansas, K. ENGLER, D. G. THOMPSON, and R. G. KAZMANN (*Arkansas Sta. Bul.* 457 (1945), pp. 56, illus. 11).**—The data obtained in the present investigation indicate that the large quantities of ground water used for irrigation in the Grand Prairie region have been replaced by percolation of water into the area, and the future extensive replenishment of the ground-water supply may be expected each year by natural processes. Estimated flow through the Pleistocene beds into the region is 135,000 acre-ft. a year, providing sufficient irrigation for about 75,000 acres of rice. However, the acreage irrigated is in excess of this amount, and it is imperative that consideration be given to methods for increasing the water supply or reducing the acreage. Three possible remedial methods are suggested: (1) The use of water from deep-lying Tertiary beds, (2) the impounding of water in small reservoirs within the region, and (3) the substitution of other crops for rice. It is desirable that a thorough study be made to make an estimate of the ultimate perennial yield of the deep-lying beds. The diversion of water from the White or Arkansas rivers would necessarily involve collective action by large groups of rice growers, and cooperative action would also be needed for artificial recharge. Ex-

perimental recharge wells should be drilled in the Grand Prairie region, and controlled tests should be made to find the best methods of using the wells to replenish the ground-water supply to determine conclusively whether recharge is practicable. It should be recognized that under the present conditions of overdraft, the lowering of water levels will continue throughout the region. Therefore, the problem of overdraft is not one of a few rice growers but of the entire community.

**A portable runoff measuring device**, M. B. RUSSELL. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 8, pp. 589-594, illus. 2).—The author describes and discusses the operation of a portable runoff measuring device which operates on the tipping-bucket principle incorporating a unique method of collecting the aliquot. The sample meets the following characteristics: (1) No permanent structures are required that will interfere with the utilization of the area after the completion of the experiment; (2) the time required to service the equipment after each storm is comparable to that needed to service a rain gage; (3) the device is reliable, mechanically simple, and unaffected by trash; (4) the device is capable of operating satisfactorily through intermittent storms having a wide range of runoff rates and silt concentrations; and (5) the amounts of both soil and water can be measured with precision comparable to that of permanently installed equipment.

**What is there to know about farm ponds?** D. B. KRIMGOLD. (U. S. D. A.). (*Agr. Engin.*, 26 (1945), No. 7, pp. 283-284).—A brief outline and discussion of what should be done to put the planning, design, and management of farm ponds on a sound basis. The author states that the primary consideration in the design of a farm pond is the dependability of the water supply and that next in line is the proper and full utilization of that water supply. Eight hydrological and structural factors enter into the dependability of the water supply, namely; (1) The evaporation from water surfaces, (2) precipitation falling on the reservoir, (3) surface and subsurface runoff, (4) use (required quantities of water), (5) seepage, (6) silting, (7) stability of dams (usually earth fills), and (8) capacity and stability of spillways, which in turn determine the stability of the dam. Design and selection of a number of appurtenances and auxiliary installations may in large measure determine the extent to which the water will be utilized. Where cheap electric power is available, motor-driven pumps can make the pond a source of water not only for livestock or fish production but also for spraying, fire fighting, overhead irrigation, and of running water in the barnyard and even in the home. Where electric power is not available, or is too expensive, hydraulic rams and other sources of power should be considered. The several available means of pumping water should be examined with a view to introducing such changes as may be needed to make them most suitable for use in connection with farm ponds. Small filters, chlorinators, and water-purification units would make water from ponds available for culinary use, and even for drinking. Improved designs of watering troughs to keep livestock water at the proper temperature throughout the year would go a long way toward increasing meat and milk production on the farm.

**Kostiakov on prevention of waterlogging and salinity of irrigated land**, D. B. KRIMGOLD. (U. S. D. A.). (*Agr. Engin.*, 26 (1945), No. 8, pp. 327-328).—A review of a technical paper originally presented in the Russian language. The author states that salinity and waterlogging are closely interrelated and are governed by two basic sets of factors namely: (1) By high levels of mineralized ground water and excessive amounts of irrigation water; and (2) by unfavorable condition of the soil (lack of crumb structure) and high content of water-soluble salts (chlorides and sulfates of Na, Mg, Ca, and others). Preventive measures must be directed toward the elimination of the principal causes of salinity and of water-

logging, and must include: (1) Creating and maintaining the necessary crumb structure of the soil, decreasing evaporation from the soil and preventing accumulations of salts in the surface soils; and (2) preventing a rise in the water table and excluding excessive amounts of ground and surface water. A number of preventive recommendations are also listed and discussed.

**The design of drainage systems**, J. G. SUTTON. (U. S. D. A.). (*Agr. Engin.*, 26 (1945), No. 5, pp. 196-198, illus. 1).—The author lists and discusses some of the problems met in the design of open drains. The following steps in the development of design of open drains for larger outlet systems are given: (1) Determining that the system will be comparatively free from the effects of erosion and siltation, and planning remedial measures necessary; (2) determining of the watershed area; (3) selecting drainage coefficients or runoff coefficients to be used in computing the size of ditch; (4) establishing a hydraulic gradient for the proposed ditch; (5) establishing minimum depth and side slopes of the drain; (6) determining of the maximum allowable velocity based on soil type; (7) determining of ditch size based on Kutter's or Manning's formulas; (8) planning auxiliary structures, operations, and maintenance practices, including bridges, culverts, inlet structures, headwalls, and bank protection for open ditches; and (9) designing of laterals and farm drains to discharge into the main drain, including tile drains and open drains.

**Obtaining soil cores for permeability tests**, W. E. GOODE and J. E. CHRISTIANSEN. (U. S. D. A. et al.). (*Agr. Engin.*, 26 (1945), No. 4, pp. 153-155, illus. 6).—A report on the development of Lucite cylinders and related technics in their use for obtaining large undisturbed soil cores for permeability tests. Sealing of the space between the core and the cylinder wall with dry sieved soil has proved satisfactory. The use of transparent Lucite cylinders offers the following advantages over the old metal cylinder method: (1) The condition of the core is immediately ascertained and if defective it can be discarded and another core taken; and (2) in the laboratory the rate of saturation of cores can be seen and controlled, and during the permeability test the retention or absorption of air, any structural changes, any "blowing out" or channeling around manometer openings, or other phenomena taking place may be observed and recorded.

**Factors that affect surface sealing and infiltration of exposed soil surfaces**, W. D. ELLISON and C. S. SLATER. (U. S. D. A.). (*Agr. Engin.*, 26 (1945), No. 4, pp. 156-157, 162, illus. 1).—The seal that usually forms on exposed soil surfaces during rainstorms consists of a thin layer of compacted soil which is less permeable to water than the material immediately beneath it. In surface sealing studies reported in this paper, variable raindrop impact was applied to soil surfaces. Infiltration was measured, and the soil carried by splash was computed by an experimentally developed splash erosion formula. Effects of rainfall duration on surface sealing from the data show that a small amount of surface sealing occurs without raindrop impact, when  $E$  (quantities of soil carried by rainfall splash) equals zero. This sealing is associated with the effects of wetting, slackening, and with adjustments of soil surface particles under the influence of surface water. Rates of such sealing are very slow and fairly uniform throughout a long-time interval. Extensive reductions in infiltration rates were invariably associated with the larger values of  $E$ . The rates of sealing were greatest during the early part of the storm, and a large part of the sealing occurred during the first 5 min. of rainfall. Surface sealing varies with rainfall duration as well as with raindrop impact. Results of the calculated values of soil splashed by raindrops allow four inferences to be made. Infiltration rates are highly sensitive to changes in  $E$ . Low infiltration rates are associated with high values of  $E$ .

**A charcoal kiln built of cinder concrete blocks**, A. R. OLSON and H. W. HICOCK (*Connecticut [New Haven] Sta. Bul.* 448, Sup. 1945, pp. 6+, illus. 5).—

This is a supplementary report (E. S. R., 86, p. 394) on experimental charcoal kilns using the chimney principle, reporting experiments with nonpriority materials, notably cinder concrete blocks. The authors give total materials of construction, complete instructions for building, detailed operation including loading, firing and coaling method and average yields obtained through 50 cycles of operation of these kilns. Better yields for both hardwood and conifers, seasoned and unseasoned, were obtained with these kilns than with steel panel kilns. The principal advantages of the cinder concrete kiln are: (1) It is built of nonstrategic materials, (2) materials for construction are inexpensive, (3) it can be assembled with ordinary labor, (4) it requires very little attention during operation, (5) it can be successfully operated by a novice, (6) it may be taken down and rebuilt at another site, and (7) it is adaptable to single unit or battery operation.

**Single-cylinder engine tests of substitute motor fuels**, D. B. BROOKS (*Jour. Res. Natl. Bur. Standards [U. S.]*, 35 (1945), No. 1, pp. 1-37, illus. 26).—Single-cylinder engine tests of nonhydrocarbon fuels and gasoline, at fixed compression ratio and at the compression ratio for trace knock for each fuel, show no material differences in performance other than those associated with differences in heats of combustion and vaporization. All the nonhydrocarbon fuels could be operated at compression ratios higher than was permissible with the gasoline, with corresponding increases in power and thermal efficiency.

**Wood gas generator** (*Connecticut [New Haven] Sta. Bul.* 484 (1945), p. 80).—Tests made on the efficiency of a new design of wood gas generator, using chipped wood refuse from birch oil mills as fuel, indicated that approximately 80 percent of the B. t. u. value of the fuel could be recovered in the form of a gas saturated with water. This gas was basic in reaction and contained practically no alcohols, acids, or ether soluble substances.

**Adjust carburetor and load tractor fully for more work from less fuel**, E. W. SCHROEDER and A. W. CYLDE (*Pennsylvania Sta. Bul.* 464, Sup. 3 [1945], pp. 8-9, illus. 2).—Tractors often consume more fuel than is necessary in performing certain kinds of work, but the authors find that the amount of fuel used in proportion to the amount of work done may be kept at a minimum in three ways: (1) By carburetor adjustment, (2) by proper loading, and (3) by using the fuel for which the tractor was designed. In general, adjustment of the carburetor at belt work means simply screwing the load screw in until the motor is short of power or backfires and then backing the screw an eighth of a turn at a time until the engine runs smoothly. In drawbar work, leaner and leaner settings are tried until the engine will not carry the load, after which the mixture is enriched slightly as when belt power is being provided. Tractors are more efficient at full loads, the trick in obtaining best fuel economy being to load them as fully as possible at all times. This can be done in two ways at drawbar work: (1) More implements may be attached, resulting in a heavier load, and (2) the tractor may be operated in a higher gear with the engine slowed down. One and one half to  $2\frac{1}{2}$  gal. of fuel can be saved per day with many two-plow tractors by operating them at full throttle and at full load. When a tractor is equipped with a low compression engine designed for burning tractor fuel, distillate, etc., these fuels should be used. If the owner of a tractor with a low compression engine desires to burn gasoline, the engine should be converted to high compression to prevent fuel waste.

**The surftiller: A new tillage machine**, M. DONNELLY. (*Calif. Citrus Expt. Sta.*). (*Calif. Citrog.*, 30 (1945), No. 9, p. 268, illus. 1).—The author describes a new experimentally developed machine for the control of cover crop by shallow cultivation without the formation of plow sole. The curved toothed blades of the soil rotor are driven by a gasoline engine. These blades chop up the cover crop similar to the action of a rotary hoe. Depending on the depth of working, which

is adjustable, and on the shape of the teeth, more or less of the chopped cover crop can be left on the surface as a mulch as a defense against erosion and a benefit to soil structure.

Cotton production cost reduced through use of mechanical equipment, H. P. SMITH. (Tex. Expt. Sta.). (5. *Cotton Res. Cong. Proc., Dallas, Tex., 1944*, pp. 22-30, illus. 2).—The author cites results of studies made on operation of mechanized equipment in the production and final harvesting of cotton which by comparison with small inefficient farm equipment indicate that everything is in favor of the better mechanization. He holds that the Cotton Belt of the South can meet competition provided it takes full advantage of the opportunities to produce better cotton with maximum economy, but that there can never be maximum economy with small and inefficient mechanical equipment. Small machinery puts too narrow a limit upon the number of acres that can be worked by the labor now available.

Flame cultivation of row crops, P. W. GULL. (Miss. Expt. Sta.). (*Agr. Engin.*, 26 (1945), No. 4, pp. 147-148, illus. 2).—The author reports on the development of the flame cultivating machine for the control of weeds and grass in cotton production, and gives a discussion of the experimental work and results obtained. Cotton to be flamed for weed control should be 8 to 10 in. tall and the stem at the ground line should be  $\frac{1}{8}$  in. in diameter.

Mechanical filbert nut picker, F. E. PRICE and R. N. LUNDE. (Oreg. Expt. Sta.). (*Agr. Engin.*, 26 (1945), No. 4, pp. 151-152, 155, illus. 2).—A report of the progress on the development of a filbert nut picker utilizing the suction principle. The experimental machine indicates that the successful harvesting of filberts by this method depends on the following conditions, all of which can be provided through additions to the original equipment: (1) Proper preparation of the ground before harvest by use of suitable drags and rollers, (2) installation of a brush to dislodge nuts still stuck in the ground, (3) separation of nuts from husks and leaves before reaching the fan, and (4) sacking the clean nuts.

Gin fan power calculations by use of nomograph, A. J. JOHNSON. (U. S. D. A.). (*Agr. Engin.*, 26 (1945), No. 7, pp. 290-291, illus. 2).—One of the great difficulties which the ginners, salesmen, and engineers face in power problems at cotton gins is that of estimating the power consumed by the fans in the outfit. The author describes a very simple and recent method of estimating fan power in the field, without calculations after pilot tube readings have been taken through the use of a simple nomograph with accompanying table of velocities and volumes corresponding to  $P_v$  readings and pipe diameter.

The South Dakota seed blower, E. L. ERICKSON. (S. Dak. Expt. Sta.). (*Assoc. Off. Seed Anal. Proc.*, 35 (1944), pp. 91-94, illus. 4).—Since the size of sample for purity analysis requires more space than is provided by any of the known seed blowers, a new blower was designed and constructed to handle these larger samples adequately. The author describes the materials used and the design and construction of the apparatus. A discussion of the performance of this new machine is also given, together with suggestions for its operation and care.

Air recirculation in drying of unbound moisture, V. P. VICTOR (*Chem. and Metall. Engin.*, 52 (1945), No. 7, pp. 105-109, illus. 4).—A study of convection drying at atmospheric pressure, where air is both the heat carrying and the moisture removing medium. A graphical presentation of the drying potential of air of various conditions is given showing how economical conditions can be selected. Drier performance is often limited by inadequacy of the air supply. The author discusses several "rules of thumb" used in drying calculations, and presents mathematical equations for quickly checking drier design data and actual performance of an operating installation.

**Automatic feed control for feed grinders, H. F. CARNES.** (Oreg. State Col.). (*Agr. Engin.*, 26 (1945), No. 8, pp. 325-326, 330, illus. 2).—A report of the development of an automatic feed control device for feed grinders to secure uniform feeding of grain containing an unusually large amount of straw, weed stems, and foreign matter. The variable-feed mechanism consists of a swinging gate or valve placed in the rectangular section of the feed hopper directly above the grinder. This mechanism is connected by a series of lever arms to the cradle mounted motor driving the mill. The torque on the motor shaft varies directly and instantaneously with the amount of grain fed to the grinder. In order that the resisting torque of the motor base equal at all times the torque on the motor shaft, the motor base must rotate either to increase or decrease the lever arm of the resisting force caused by the weight of the motor base. It is this rotation which is made to actuate the feed-regulating valve.

**Determination of band stresses and lateral wheat pressures for a cylindrical grain bin, L. R. AMUNDSON** (*Agr. Engin.*, 26 (1945), No. 8, pp. 321-324, illus. 8).—The author reports results of experimental tests made to determine band stresses and lateral pressures for a cylindrical grain bin. Testing procedures and results are given in tabular and graphic form. It is pointed out that the results apply only to the bin examined and not necessarily to bins of other shapes, sizes, and materials or to wheat of a different weight or moisture content. However, the author concludes: (1) There are variations in grain pressures within a bin or band tensions even under normal storage conditions, (2) Janssen's formula may be used to determine safe design pressures, and (3) safe values for factors in Janssen's formula in designing shallow Insulite bins for wheat storage are: (a) Weight of wheat = 49 lb. per cubic foot, (b) coefficient of friction of wheat on Insulite walls  $U^1 = 0.400$ , and (c) ratio of lateral to vertical pressure,  $K = 0.50$ .

[**Potato storage investigations by the Colorado Station**] (Coop. U. S. D. A.) (*Colorado Sta. Rpt.* 1944, pp. 31-33).—Data obtained from observations and assistance in management of experimental storages of potatoes indicate: (1) Change from sack to bulk storage will result in the marketing of 1.5 to 3.5 percent more of the crop stored; (2) storage in boxes rather than bulk, because of improved market quality, will result in an added profit of 6 ct. per hundredweight; (3) "shell-cooling" in place of "through-bin-cooling" indicates 2 to 4 percent more marketable crop from the total stored; (4) the practicability of storage of crops requiring high and low humidity in the same room was demonstrated, accomplished by regulating the room at low humidity but storing the high humidity products in paper-lined containers; and (5) a change in design and management of a 40,000-sack storage facility resulted in sprout-free storage to April 15.

**Proper design and management reduce maintenance costs of potato storages, D. C. SPRAGUE, W. F. ACKERMAN, and J. S. CORB** (*Pennsylvania Sta. Bul.* 464, Sup. 3 [1945], pp. 1+, illus. 2).—Straw loft potato storages, of a type developed in Potter County, have been found successful and low in initial cost, but improper design or management may result in conditions which favor the very rapid deterioration of the structure itself. This deterioration can be prevented by proper ventilation. A combination of 2 ft. of straw and shavings or sawdust serves (1) to provide insulation against heat and cold, and (2) to absorb and allow the passage of water vapor to the outside. This straw layer also prevents water from condensing on the ceiling and dripping on the potatoes. Two periods during the year are critical in the management of such potato storages. In the fall, just after storing the tubers, the humidity is extremely high at the same time that the temperature is ordinarily held around 60° F. The rate of moisture loss from potatoes in storage is highest during this and the subsequent period during which the potatoes are cooled, and it is important to prevent the straw layer from

becoming excessively laden with moisture when temperatures are such as to favor the growth of organisms which cause the deterioration of the structure. The second critical period comes during the spring when temperatures begin to rise and become favorable for decay. During the summer months the straw and wood members must be thoroughly air dried to bring their moisture contents to nearly 10 per cent. The authors conclude: (1) Plenty of ventilation must be provided over the straw layer all year round; (2) enough straw should be provided for insulation to prevent condensation on the wood supporting the straw layer; (3) ventilation within the storage should be sufficient to prevent condensation on the wood under extreme conditions; and (4) a relatively large air space should be provided between the potatoes and the ceiling.

Performance characteristics of commercial home freezers, J. R. DONNALLEY, Jr. (*Cornell Engin. Expt. Sta. Bul. 34* (1944), pp. 16, illus. 3).—Results of insulation efficiency tests of six commercial freezers indicate that with less than 4 in. of insulation material operating costs are excessive and insurance against power interruptions inadequate, while with more than 6 in. the box is inconvenient for handling or the storage space is limited. Power consumption per unit volume of box decreases slightly as the volume of the freezer is increased. The author reports on experimental freezing studies of top round beef made in an experimental freezing apparatus, and a reproducible method of calculating the rate of freezing through a food material is presented.

The postwar farm structures situation, K. J. T. EKBLAW (*Agr. Engin.*, 26 (1945), No. 4, pp. 149-150, 155, illus. 1).—The author emphasizes the importance of farm buildings, discusses some of the factors that will affect the farm building situation after the war, and advises that we must be ready to help the farmer solve his building problems. The situation sums up as follows: (1) A tremendous need will exist for the rehabilitation and modernization of old and for construction of new farm buildings; (2) little attention is being given to designing buildings to meet modern farming demands, while agriculture in general will continue to suffer from a lack of properly designed buildings; (3) the standard types of building material are likely to be in short supply for a considerable period, and the necessity for using new and untried materials may result in a great waste of time, effort, and money; and (4) construction in the farm field will also likely be hampered by a shortage of skilled building labor, which in turn will seriously impede efficient postwar production.

Poultry housing (*New Jersey Sta. Rpt.* 1944, p. 58).—Field experiments based on new ideas in poultry housing construction using a wood framework overlaid with asbestos board indicate the following advantages: (1) Its form provides plenty of head room, and it is (2) easily erected through use of prefabricated sections, (3) neat and attractive, (4) of considerable insulating value, and (5) needs no painting. The practicability of using masonry construction for poultry houses was proved by testing an experimental installation using cinder block for walls and concrete for floors. A unique ventilation system admits air through vertical holes in the front wall blocks, discharging at window-sill level inside the house and exhausting through rafter ventilators at the front of the low-pitched shed-type roof.

Wood preservation (*Connecticut [New Haven] Sta. Bul.* 484 (1945), pp. 78-79).—A replicated experiment on the preservation of poles of red maple, red pine, Scotch pine, and pitch pine was started in 1933. Three-ft. butt treatment with creosote by the open tank (hot and cold bath) method and complete pressure zinc-meta-arsenite treatment were made on all species. In 1944 the zinc-meta-arsenite treated poles were found to be in good condition, but the tops of most all creosote

butt-treated poles were in bad condition. It is concluded from this experiment that: (1) A thorough butt treatment with creosote by the open tank process may be expected to protect posts of these species against decay when in contact with the soil for a period of 15 yr. or more; and (2) the untreated tops of poles of these species may become unserviceable in 5 yr. and probably cannot be expected to last more than 12 yr. in most cases. Treatment of the top is need to insure a proper balance of durability between the top and butt. Although it may be impracticable to use creosote on the tops of tobacco poles, due to the effect of creosote fumes on the tobacco plant, other preservatives could be applied to prolong the life of the tops.

**Testing paints** (Coop. [N. Y.] Cornell Expt. Sta.) (*New Jersey Stas. Rpt. 1944*, p. 43).—Data on experimental testing of paints applied to various wood panels and exposed to direct southern sunlight for a period of 5 yr. indicate: (1) The kind of wood may be an important factor in paint failure; (2) substitution of 25 percent by weight of soybean oil for linseed oil in white paint can be made without unfavorable performance; and (3) incomplete tests indicate that an even higher proportion of soybean oil can be used satisfactorily in barn red paints.

**Shop work on the farm**, M. M. JONES (*New York and London: McGraw-Hill Book Co., 1945*, pp. 486+, illus. 598).—A practical reference book for farm shop work. Deals simply and directly with tools, materials, operations, and processes.

**Agriculture's safety challenge**, C. L. HAMILTON (*Agr. Engin.*, 26 (1945), No. 4, pp. 145-146, 148, illus. 5).—A discussion of the seriousness of the farm accident problems indicates that during 1943 all types of accidents cost agriculture about 17,200 deaths, 1,500,000 nonfatal injuries, 25,000,000 man-days of work, and, inestimable human suffering. The records indicate that in agriculture the chance of an accidental death is over twice as great as in either the manufacturing or the trade and service industries. Farm accidents can be reduced if accident hazards and unsafe working habits are determinedly eliminated. A four-point program includes: (1) Farm accident statistics which show the type and causes of accidents in any State or community; (2) techniques—developing accident prevention techniques and recommendations; (3) safety education; and (4) action—developing safety principles and practices and teaching them as an integral part of each farm job.

## AGRICULTURAL ECONOMICS

**Agricultural price control**, G. S. SHEPHERD (*Ames, Iowa: Collegiate Press, 1945*, pp. 361+, illus. 36).—The governmental operations of the United States designed to control prices of farm products are dealt with as follows: Part 1, Stabilizing Agricultural Prices by Controlling the Market Supplies of Farm Products, with chapters on early experiments with agricultural price controls; the Federal Farm Board, 1929-33; the Commodity Credit Corporation—stabilization operations, 1933-41; effects of these operations on prices and stocks and with respect to place and form and appraisal of these operations; stabilizing corn, wheat, cotton, and perishable products prices against fluctuations in supply; and international commodity agreements. Part 2 deals with Stabilizing Agricultural Prices by Controlling the Demand for Farm Products, with chapters on development of subsidized consumption programs; wheat export subsidy and cotton surplus disposal programs; analysis of the effects of consumption subsidies; analysis of the effects of the wheat and cotton subsidy programs; and some controversial issues and proposed solutions. Part 3, Local and Regional Programs for Controlling Market Supply and Demand, has chapters on agricultural marketing agreements; effects of marketing agreements for milk; marketing agreements for fruits and vegetables; and effects of marketing agreements for fruits and vegetables. Part 4, The Problem of Controlling Agricultural Prices After World War II, deals with agricultural

price control during World War II; supporting agricultural prices after the war—reducing the supply and increasing the demand; possible revisions of the postwar price support legislation; parity prices as price objectives after the war; appraisal of parity prices; constructive suggestions for other objectives than parity prices; and over-all perspective.

The rural land market in the northern Idaho grain-pea area, A. N. NYBROSEN (*Idaho Sta. Bul. 261 (1945)*, pp. 16, illus. 1).—The trends of prices during and between World Wars I and II; prices for high- and poor-quality lands; the effects of prices of wheat, all-weather roads, nearness to schools and markets, size of fields, etc., on land prices; and wartime interest rates; size and duration of loans; and repayment privileges, etc., during World War II as compared with earlier periods are discussed.

"During the first 3 yr. of World War II the prices of grain and peas rose sharply in the area studied. The price of land responded to these rises, but not until the latter part of 1944 did land prices reach the 30-yr. average of 1915 to 1944. Wheat prices rose comparatively more and sooner than land prices. However, not since 1928 had wheat prices been high enough, during peacetime, to yield a normal return on the investment at the prices paid for land in the latter part of 1944. The relationship between the prices of better crop land and poorer crop land still remains rather illogical because the price of the normally overpriced poorer land had by 1945 risen as much as that for the better land. Of several man-controlled factors studied, all-weather roads have the most significant effect on land values. The premium paid for good roads, in the form of higher land prices, has fallen during the war. Normally the prices of land adjoining all-weather roads are generally higher than those of land not adjoining by amounts greater than the cost of building the roads. Especially is this true in the better farming areas studied. During the war the prices of comparable land nearer town have risen more than those of land farther out. Premiums in land prices indicate that buyers of land are interested in the maintenance and extension of certain community improvements and services." Farm land indebtedness in the area was greatly reduced during the war even though land prices increased considerably. The average interest on new mortgages was 4.4 percent as compared with 5.2 on those released.

"The debt burden remains heavier on the poorer lands because larger percentages of the market value, which is relatively high for the quality of the land, are loaned and at higher interest rates. In mortgage notes calling for 6 percent annually, the annual interest is about 8 ct. per dollar of assessed value of mortgaged real estate, while in the notes calling for 3.5 percent or less it is only about 4 ct."

Wartime land market activity in the State of Nevada, H. V. STONECIPHER, H. G. MASON, and D. DUNN. (Coop. U. S. D. A.). (*Nevada Sta. Bul. 174 (1945)*, pp. 14, illus. 7).—Farm land values, incomes, and indebtedness for the State are discussed with charts showing the increase in value per acre 1939-44 compared with the United States and six western States; the indexes of the Nevada farm real estate values March 1, 1914—March 1, 1945; and the percentages of changes in such values March 1, each year, 1914-23 and 1939-45. The land market activity in Elko, Washoe, and Humboldt Counties is discussed with tables and charts showing by years, 1941-44, the number of transfers, acreage transferred, and the average price per acre of irrigated, mixed irrigated and range, and range lands transferred; number, average period held, and increase in prices of resales of identical tracts; buyers' equity relative to 1942 prices for each of the three types of land; sources of new mortgage financing; and types of buyers and sellers. The implications of the land market situation are also briefly discussed.

The Ohio farm real estate situation, 1941 to June 1944, as indicated by a study in sample counties, H. R. MOORE (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul. 180* (1944), pp. 8+).—The information in Mimeographed Bulletin 173 (E. S. R., 90, p. 842) is supplemented and brought up to date.

Farm real estate market in Tennessee, 1850-1944, B. J. LUEBKE and J. H. MARSHALL (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 184* (1945), pp. 41+, illus. 29).—The chief sources of data for this study are stated as follows: "Estimates of land values given to census enumerators by farmers are available for each county of the State from 1850 to 1940. Annual indices of price are available from the Federal Bureau of Agricultural Economics for the State as a whole from 1912 to date; and also the annual rate of selling activity by type of transfer. Type of transfer, by counties, was also obtained in the 1934 Bureau of Agricultural Economics and Experiment Station survey." The number of voluntary, forced, and other types of transfers principally from 1926 to 1943, credit agencies as buyers and sellers, and trend in types of transfer by major divisions of the State are discussed. Tables and charts show the trend of prices of land by types of farming areas, as shown by the census reports of 1850-1940. The relations between gross farm income, farm prices, and rates of farm transfers, and between net farm income per acre and value of land per acre are discussed. A section on cash rent as a measure of values discusses cash rent per acre and per \$100 of value by counties, and makes comparison of such rent with census values. The relation of value of farm buildings to land values is also discussed.

Method of payment and comparative prices for Tennessee farms, J. H. MARSHALL (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 181* (1945), pp. 34+, illus. 14).—The most important sources of data for the study were schedules collected in cooperation with the Federal Civil Works Administration in 1934. The importance of different types of transfers, the financial arrangements accompanying farm real estate transfers, and the relation of sale prices and assessed valuations by counties and size and value groups are analyzed and discussed. Comparisons are made of the average price per acre and number of acres per farm in voluntary sales and foreclosures, of sale prices and census values, and of sale prices and crop reporter values of farms.

Shall I buy a farm? A. G. WALLER, H. KELLER, JR., J. W. CARNROSS, W. F. KNOWLES, and K. R. SLAMP (*New Jersey Sta. Bul. 719* (1945), pp. 31, 2 illus.)—This is a bulletin for the assistance of returning servicemen and others interested in purchasing farms in the State. Sections discuss the various types of farms in the State, with some information regarding expenses, receipts, income, etc., that may be expected under normal conditions.

A postwar crop and livestock pattern for Ohio under conditions of full employment (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul. 183* (1944), pp. 46+, illus. 1).—A report prepared by the State Committee on Production Adjustments in Ohio Agriculture in response to a request of the U. S. Department of Agriculture for a statement of the desirable land use, crop, and livestock production pattern which might prevail in Ohio in peacetimes under certain assumed conditions.

Attaining maximum agricultural production in Ohio in 1945 (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul. 182* (1944), pp. 29+).—A report prepared by the State Committee on Maximum Wartime Agricultural Production in Ohio in response to a request of the U. S. Department of Agriculture for a statement as to the crop acreages and livestock production which might be expected in Ohio for the year 1945 under certain assumed conditions.

**Post-war farm production: Rhode Island**, J. L. TENNANT and O. F. MCGUIRE. (Coop. U. S. D. A.). (*Rhode Island Sta. Misc. Pub.* 23 (1944), pp. 7+).—Estimates are made of the probable production of Rhode Island farms under favorable business and price conditions and with full employment in the years following the transition from war to peace; and the practices which will aid farmers in reducing costs and obtaining the levels of production suggested are outlined.

**A pattern of agricultural production in South Carolina after the war**, M. J. PETERSON and G. H. AULL. (Coop. U. S. D. A.). (*South Carolina Sta. Bul.* 356 (1945), pp. 32, about 10 illus.).—This report is based upon extensive research information obtained over a period of years and critically reviewed in 1944 by the South Carolina Committee on Production Adjustments in Agriculture.

"A major objective of this study is to provide some measure of the extent of the problem of agricultural reconversion in South Carolina and to indicate some of the changes which may be necessary in order to meet it. Specifically, the purpose is to suggest a pattern of land use for the State based on probable requirements for agricultural products and anticipated yields from improved practices. . . . The suggestions made are based on the best available information and are intended to serve as a benchmark in appraising the future possibilities of agricultural production in South Carolina. This objective has been accomplished by combining the latest technical information with an appraisal of the economic factors likely to influence the development of agriculture in the postwar period. This report represents the current thinking of a group working in close cooperation with farmers, agricultural administrators, and professional agricultural technicians."

The three sections of the report deal with improved practices; the pattern of production for different crops, kinds of livestock, and other land uses; and technological improvements and the need of farm workers.

**The postwar economic outlook in an agricultural-industrial area**, G. H. AULL and J. M. STEPP (*South Carolina Sta. Bul.* 355 (1945), pp. 43, about 15 illus.).—"This publication is a report on a fact-finding survey conducted in the spring and early summer of 1944 by the citizens of Anderson and Anderson County under the auspices of the Anderson Chamber of Commerce. The general purpose of the survey was to gather information that would be of value to business men and public officials in planning sound and desirable employment-producing activities after the war. Housewives, business men, public officials and farmers filled out around 1,750 questionnaires dealing with employment, occupations, family incomes, demand for various products, financial arrangements for postwar purchases, the general financial condition of the county, and other pertinent topics. The information obtained in this manner was carefully analyzed and checked against data from a variety of other sources." The subject is discussed under sections on the employment situation covering workers available, jobs in view, and the employment problem; postwar business outlook discussing purchasing power, consumer demand, farmer demand, and suggested public improvements; and postwar opportunities.

**Prospective farming on the Columbia Basin Irrigation Project**, B. H. PUBOLS (*Washington Sta. Bul.* 456 (1945), pp. 47, illus. 8).—The project—its engineering factors, land included, estimated per acre construction cost, and water charges—and the elevation, topography, climate, soils, land classes, land ownership, transportation and market facilities of the Columbia Basin, etc., are described briefly. The crops and kinds of livestock adapted to the project, the probable cropping systems and acreages, yields and value of crops, and the number of livestock and values when the project has reached maturity are estimated, and the prospective markets and the types and systems of farming are discussed. Maps show the land classification, geographic subdivisions, and prospective type of farming areas

of the project. Estimated budgets for farms of several types are included. Farming during the development period of the project is discussed, and suggestions to prospective farmers are included.

**Post-war Washington agriculture under conditions of relatively high national income** (*Washington Sta. Mimeog. Cir. 25 (1945)*, pp. 22+, illus. 1).—"This report is Washington's part of a nationwide study being conducted cooperatively between the agricultural colleges and various agencies of the U. S. Department of Agriculture, particularly the Bureau of Agricultural Economics. It represents the composite thinking of specialists in a wide variety of subject-matter fields and agencies in relation to desirable postwar shifts in agricultural production under assumptions of relatively high incomes and employment."

**Idaho employment in relation to agriculture** (*Idaho Sta. Cir. 104 (1945)*, pp. 4).—This leaflet, prepared for the Idaho Postwar Program Committee, discusses briefly the occupational groups in Idaho, off-the-farm work, wages of farm workers, seasonal employment, and problems of in-migration, and makes suggestions and recommendations.

**A study of the agricultural production program in Utah for post-war period.** (Coop. U. S. D. A. et al.). (*Utah Sta. Mimeog. Ser. 313 (1944)*, pp. 26+).—"The purpose of this study is to set forth as precisely as is possible at this time the size, pattern, and nature of the agricultural plant that will be desirable and feasible in the postwar period." It was prepared by a crop and a livestock committee composed of representatives of different departments of the Utah State Agricultural College and of several bureaus of the U. S. Department of Agriculture.

**New Mexico dry-farming areas**, M. EVANS (*New Mexico Sta. Bul. 320 (1945)*, pp. 34, illus. 1).—Information on the dry-farming areas is given for returning veterans and others desiring to go into farming or ranching in New Mexico. The climate, topography, soils, vegetation, crop yields, range carrying capacity, population, transportation facilities, type of farming, organization of farms, investment requirements, income from farming, etc., are described and discussed. Suggestions are given as to types and sizes of farms, and the hazards in dry-farming areas are described.

**Cost of producing milk in northern Illinois**, R. H. WILCOX and C. S. RHODE (*Illinois Sta. Bul. 511 (1945)*, pp. 497-520, illus. 4).—Data were obtained for 90 farms in 1936 and 99 in 1937, located in 12 counties in the Illinois portion of the Chicago milkshed. Part 1 analyzes the quantities of different feeds used and hours of man labor absorbed in producing milk, and the percentages these items were of net costs of production. A method (formulas and charts) was devised for computing costs of production with different farm prices of corn, wages of labor, and different yearly milk production per cow. Part 2 discusses the effects of production per cow, size of herd, use of milking machine, and season and month of year on milk costs.

Feed constituted 53.9 percent and man labor 18.5 percent of the net cost of producing milk. Fifteen percent of the other costs fluctuated with feed costs and 45 percent with farm wages. Unit cost of production increased from \$1.55 per 100 lb. for cows producing 9,000 to 10,000 lb. of milk yearly to \$2.11 for those producing 6,000 lb. yearly. Addition of a cow to herds of 10 to 30 cows caused sufficient saving in labor and other cost to lower the cost of milk production 4 ct. per 100 lb. Milking machines enabled users to produce 10 lb. more milk per hour of labor and resulted in a yearly saving of \$2.30 per cow. The profit per cow in 173 herds was \$2.16 per month during the 5 summer months and 55 ct. during the 7 mo. of barn feeding. The average yearly profit per cow was \$14.25. Herds in which April, May, and June milk production rose as high as 130 percent of the

annual monthly average and in which September, October, and November production dropped to 75 percent of such average returned a profit of only \$6.26 per cow. Herds in which production in any month did not go more than 10 percent above or below the monthly average for the year made a yearly profit of \$22.25 per cow.

The cost of producing apples in Ohio, 1943, C. W. HAUCK (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Monog. Bul. 181* (1944), pp. 32+, illus. 3).—Analysis is made of data obtained from schedules returned by 136 apple growers.

The growing and harvesting costs averaged \$1.66 per bushel, and the after-harvest cost, 79 ct.

Costs, returns, and practices in growing snap beans, Johnson County, Tennessee, 1942, H. J. BONSER, E. B. FICKEL, and C. E. ALLRED (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 182* (1945), pp. 63+, illus. 28).—Analysis is made of data secured from 106 growers selected in different communities of the county.

Feed consumption and marketing weight of hogs, L. J. ATKINSON and J. W. KLEIN (*U. S. Dept. Agr., Tech. Bul. 894* (1945), pp. 28, illus. 6).—The general procedure, findings, and conclusions in this study are stated by the authors as follows:

"Data on feed consumption and live-weight gain of hogs were obtained from 12 experiments in 5 Corn Belt States. The relationships shown by these data provided the physical basis for developing the procedure for calculating the most profitable marketing weight. Calculations were made, using 1930-41 prices, then the feed consumption and live-weight gain of the entire hog enterprise were estimated by adding the feed and gain of the breeding herd to the experimental data relating to the period after weaning.

"The feed-and-gain data from the 12 experiments show that as the weight of hogs increases, larger quantities of feed are consumed per unit of gain, but that the increase in feed consumption is less than is generally recognized. For the gain in weight between 225 and 250 lb., 8 percent more feed units are consumed per 100 lb. of gain than are needed to bring a hog up to 225 lb. (including the feed and gain of the breeding herd). Hogs between 250 and 275 lb. consume 13 percent more, and hogs between 275 and 300 lbs., 18 percent more feed per 100 lb. of gain, than the 225-lb. hog. These percentages refer to additional feed consumption (in feed units) for gain in weight.

"In estimating total feed consumption from one year to another under alternative sets of farm plans, the feed and gain of the breeding herd should be included and the average rather than the additional feed consumption per 100 lb. of live weight should be computed. On this basis the difference in average feed consumption per 100 lb. for hogs of different weights is very small. In terms of feed units the average feed consumption per 100 lb. of live weight rises only 1 percent from 225 to 250 lb., 2 percent from 225 to 275 lb., and 3 percent from 225 to 300 lb.

"In deciding on the most profitable marketing weight, comparisons are made between the total costs of keeping the hog for a given period and its increase in value during this period, allowance being made for the usual seasonal changes and for discounts or premiums on heavier weights. Price comparisons for hogs of different weights must allow for growth. For example, pigs farrowed in April average 150 lb. in October, 200 lb. in November, and 250 lb. in December. The prices for the alternative marketing months, therefore, are the appropriate ones to use in determining whether hogs should be held to heavier weights.

"The relationship between feed consumption and live weight found in this study must be understood as applying only to Corn Belt hogs raised under prevailing prac-

tices. Any pronounced change in the usual practices of feeding and management would modify the feed-gain relationship."

**Labor and power used for Arkansas crops and livestock, M. W. SLUSHER and W. T. WILSON.** (Coop. U. S. D. A.). (*Arkansas Sta. Bul.* 456 (1945), pp. 63, illus. 1).—"This study is based on data collected during the period 1934-42 by special enterprise studies and as a special phase of detailed farm management and agricultural adjustment studies. Special crop and livestock enterprise schedules were used to obtain the information. The crop enterprise schedule included the production operations performed, date of performance, rate of performance, and the type of power and equipment used in production. The schedule for livestock included labor, feed and miscellaneous items, and the production per unit for certain classes of livestock. The survey method, by personal interview of individual farm operators, was used in collecting the data."

Tables are included and discussed showing: (1) The amount and proportion of principal crops for the State and distribution of crop acreages, 1942, by areas (northern, central, southern, and eastern); (2) average yields, 1937-41, and the assumed normal crop yields used for calculating labor and power requirements for different crops; (3) for the 4 regions of the State, the usual man labor by months and the total power used per acre for different crops; (4) for individual crops, the date of performance, acres covered per day, times, and total man, horse, and tractor time for different operations; and (5) State averages of hours of man labor used per acre for different crops. Other tables with discussion show the usual amount and monthly distribution of man labor per unit of different types of livestock; usual number of amounts of plants, seed, and fertilizer used per acre for different crops, and usual amounts of concentrates and hay fed per unit of different kinds of livestock.

**Low-cost labor, power, and machinery set-ups for Indiana farms, J. C. BOTTMU** (*Indiana Sta. Bul.* 502 (1944), pp. 30, illus. 11).—The findings are based on the analysis of data from the following four sources: "9,365 farm accounts kept in all parts of the State during the 11 yr. 1930 to 1941, a power survey made in central Indiana for the year 1938, a crop cost study made in central Indiana from 1937 to 1940, and the U. S. Bureau of Census publications from 1920 to 1940."

Some of the findings were: Labor, power, and machinery charges made up 70 percent of the total farm operating costs from 1937 to 1941. A two-bottom plow, general purpose tractor, alone or plus a team or a supplementary tractor, provided the most economical and profitable source of power for Indiana farms between 100 and 320 acres in size. Labor and machinery costs averaged approximately \$3 less per crop-acre on 240- to 320-acre farms than on 80- to 120-acre farms. The total hourly cost (not including operator) in 1938 of operation was: 65 ct. for a one-plow tractor, 53 ct. for a two-plow tractor, and 59 ct. for a three-plow tractor. The greatest savings from the use of tractor power occurred through increasing the accomplishments per man rather than through a reduction in power costs. The cost of maintaining a work horse per hour used averaged 15 ct. on horse farms and 20 ct. on horse-tractor farms. Annual feed cost per work horse averaged \$49.94 on horse farms and \$41.64 on horse-tractor farms. On an average farm 2.6 hr. tractor labor and 5 hr. horse labor were used annually per tillable acre. Most of the economics of large farms (240 acres and over) result from being able to use the large scale labor-saving machinery and power efficiently. Small farms (100 acres and less) cannot effectively compete with large farms in grain production because of the opportunity on the large farm to use larger labor-saving machinery and power units effectively. Labor may be saved on many farms by shifting further to mechanical powers or by hiring labor-saving custom mechanical powered machinery.

Lemon picking costs and pruning policy, R. J. SMITH. (*Univ. Calif. Citrog*, 30 (1945), No. 10, pp. 302-303).—The discussion includes tables showing the effects of height of trees, yield per tree, size of fruit, and variety upon the minutes required per field box for picking.

Financial operations of Ohio farmer owned elevators during the fiscal year 1943-44, B. A. WALLACE (*Ohio State Univ. and Sta., Dept. Rural Econ. Mimeog. Bul.* 179 (1944), pp. 22+).—A continuation of the series (E. S. R., 90, p. 265).

Agricultural cooperatives in the postwar period (*U. S. Dept. Agr., Interbur. Com. on Postwar Programs*, 1945, pp. 41+).—Part 1 discusses the present status of agricultural cooperation, the economic and social significance, and the limitations of cooperatives, and some of the objectives in their development in the postwar period. Part 2 discusses the current status and future possibilities of cooperative activities in different specific fields. Part 3 outlines a suggested procedure for working out a postwar program of development in the local community.

Factors affecting farm fire losses in Vermont, T. M. ADAMS (*Vermont Sta. Bul.* 524 (1945), pp. 27, illus. 12).—The study is based on information regarding fires occurring on about 22,000 properties insured by the Patrons Co-operative Fire Insurance Co. and the Farmers Co-operative Fire Insurance Co. during the period 1938-42, inclusive. The fire losses, the loss rates, place of origin, time, and reported causes of the fires, and the factors affecting fire losses, are described and discussed. Farm fire losses in Vermont exceed \$700,000 annually. While two-thirds of the fires started in dwellings, such fires caused only two-fifths of the total damage. One-fifth of the fires started in main barns and caused one-half of the damage. Loss rates on dwellings and contents were \$4.61 per \$1,000 of insurance in force. Those on barns and contents were \$1.10 higher. The loss rates on livestock amounted to \$2.27 per \$1,000 of insurance. Fires were less frequent, but the losses were greater, on unoccupied farms.

Foreign Agriculture [July-August 1945] (*U. S. Dept. Agr., Foreign Agr.*, 9 (1945), Nos. 7, pp. 97-112, illus. 1; 8, pp. 113-128, illus. 6).—No. 7 includes articles on Agricultural Production and Trade in French North Africa, by L. Bacon (pp. 98-105); United Kingdom Cattle-Production Policy, by D. D. Jones (pp. 105-108); and Tree Shelterbelts at a Soviet Experiment Station, by T. Mills (pp. 108-112), noted on page 721.

No. 8 consists of an article on The Agriculture of Costa Rica, by K. H. Wylie, describing the physical and economic background; development and present status of agriculture; the export, food, and raw-material crops; the government policy; the livestock and forest industries; and the effect of the war.

## RURAL SOCIOLOGY

Migration of North Dakota farmers, P. V. HEMPHILL (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 5, pp. 17-20).—This study indicated that high agricultural income during wartime does not necessarily enhance the stability of the farm family. Land sales increase, causing displacements. Operators not subject to military service are hampered because members of the family may be called into service. These difficulties, to which may be added shortages of machinery and available labor, cause many farmers to move to smaller farms or to quit farming. On the other hand, good crops and higher prices enable some farmers to retire and others to buy farms. High agricultural income tends to result in a more stable agriculture.

Movement of farmers within Sargent County, N. Dak., during the two year period, January 1943 to January 1945, S. M. THORFINNSEN (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 5, pp. 12-16, illus. 3).—The study showed that of a total of 96 moves only 12 were due to the purchase of a farm, the large majority being

tenant moves. A total of 63 farmers made moves from one farm to another within the township during the 2-yr. period at an estimated cost of \$150 each, or a total of \$17,550. The cost of 42 moves from the outside into the county is estimated at \$200 each, or a total of \$8,400. Of those who quit farming, 37 made comparatively short moves to towns within the county, which, at \$150 apiece, totalled \$5,550. In addition, 21 went to defense plants and 33 left the county. Of the 63 moves from one farm to another within the township, 36 were made by tenants and 21 by tenants buying land. Of 54 farmers who moved from one township to another, 29 were tenants; 23 moved onto farms that they had purchased. The survey also indicates some 140 vacant sets of farm buildings, varying in value from practically nothing to as much as \$5,000-\$10,000.

**Population in relation to resources and employment opportunities in South Carolina,** A. D. EDWARDS (*South Carolina Sta. Bul.* 358 (1945), pp. 63, illus. 33).—According to this study, wartime migration has accentuated social and economic problems, both in areas which have lost and in those which have gained population. Employment in nonagricultural occupations has steadily increased since 1870, both in absolute numbers and in relative importance. In 1930, about half of all workers were engaged in nonagricultural occupations, in 1940 60 percent, and in 1943, as a result of further shifts during the war, about two-thirds of all employed workers. Two hundred thousand, or about half of all nonfarm workers, were engaged in work covered by unemployment insurance in 1940. Some further adjustments in employment may be expected in the postwar period, but there is nothing to suggest a reversal of consistent industrial growth. The average South Carolina family entirely dependent upon the salary or wages of its members reported in 1939 an income of \$694, while the average net farm income was \$606, as compared with a national average of \$718, and exceeded by 38 States.

Between 1920 and 1940, South Carolina suffered a net loss by migration of about 357,000 persons. The rural farm population sustained total losses of about 477,000, but the urban population gained about 90,000 and the rural nonfarm population about 30,000. In general, the heaviest migration has been away from rural areas, these having the smallest resources and the highest birth rates. Birth rates are lowest in the urban and industrial areas, and levels of living are highest. Population has increased in such areas as a result of migration from other sections, where the land tends to be poor, investment in farm machinery small, and agricultural production decreasing. Although birth rates are high, most of these areas are declining in population.

Opportunities for employment in the postwar period depend largely upon the extent to which industry continues to expand, as it is estimated that only about two-fifths of the boys coming to working age in 1940-50 would be needed to replace workers who die or retire during the same period. Efforts should be made to develop locally appropriate industries in areas with meager resources. The alternative is to encourage migration. Education policies should be directed toward more adequate training for nonfarm work in rural areas where only a part of the youth can be absorbed into agriculture without still further lowering incomes. Educational and health facilities should be equalized by greater State and Federal assistance. To prevent extreme overcrowding and the development of undesirable living conditions, land zoning for farming and for rural nonfarm residence should be considered.

**Health and mortality in Louisiana,** L. KEMP and T. L. SMITH (*Louisiana Sta. Bul.* 390 (1945), pp. 47, illus. 25).—According to this study of census data, diseases of the heart are far out ahead among all the causes of death in Louisiana, killing people at the rate of more than 250 per 100,000 population. Pneumonia and influenza, nephritis, cancer, diseases of the nervous system, tuberculosis, accidents other than

those in which motor vehicles are involved, causes associated with premature birth, syphilis, and motor vehicle accidents, in the order named, complete the 10 leading causes of death in the State, which account for three-fourths of all deaths. Louisiana's farms enjoy a definite advantage over its towns and cities from the standpoint of health and longevity. Louisiana Negroes have much higher mortality rates than the white population. Louisiana compares unfavorably with the nation in the control of transmissible diseases among both white and Negroes, rural and urban. However, in 1940 the mortality rates from pneumonia and influenza, tuberculosis, typhoid fever, malaria, diphtheria, and most other contagious diseases, were only fractions of what they were in 1920. The improvement was much greater, relatively, among the Negro than among the white population of the State.

A series of charts graphically illustrate the findings.

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

Current school and college education in agriculture for Iowa farmers, J. A. STARRAK. (Coop. U. S. D. A.). (*Iowa Sta. Bul. P74* (1945), pp. 457-496).—The investigation was made to obtain an evaluation of the programs of agricultural instruction in the high schools and colleges of Iowa, especially those intended for actual farm operators, and to obtain suggestions for the improvement of these programs.

"The judgments of 243 eminently successful farmers of Iowa were obtained on the following topics: (1) The amount of education in agriculture needed by farmers, (2) current programs of education for farmers, (3) the proper objectives to be achieved in a program of education in agriculture, and (4) the new curriculum in farm operation at Iowa State College."

The optimum amount of education needed was placed at 2 yr. of collegiate instruction by approximately 50 percent of the farmers, 4 yr. of high school by 17 percent, and 4 yr. of college by 16.5 percent. Twenty-four percent of the farmers believed that sufficient education in agriculture can be obtained in the high school, 7 percent believed that such instruction should be restricted to the post-high school period, and 69 percent recommended various combinations of high school and collegiate instruction. Over 50 percent believed the following criticisms were generally true of public school education: Not enough emphasis upon practical applications of theory, pupils do not learn to work, courses not closely connected with community life, not enough emphasis upon religion and morals, not enough vocational work given, pupils not taught to think, and teachers not interested in rural life and problems. Over 75 percent believed that instruction in agriculture should give considerable emphasis to development of interest and appreciation in the conservation of natural resources; importance of agriculture in our national and international economy and general welfare; pride and enjoyment in farming and rural life; importance of the farm home and family; the economic loss caused by weeds, insects, and diseases; and improvement of economic and social conditions in our rural areas. A like percentage believed considerable emphasis should be given to development of the essential abilities involved in soil management, farm management, livestock feeding and management, crop production, livestock selection, livestock disease control, crop utilization, weed control, farm records, and maintenance of the farm home. Less than 50 percent of the farmers believed that considerable emphasis should be given to the development of abilities in the following activities: Identification of weeds, crops and crop seeds; livestock breeds; production of gardens, poultry, and horticultural products; interpretation of farm leases, mortgages, etc.; selection of farm power units and landscaping of farmstead. "The reaction of the farmers toward the new curriculum is quite favorable."

**Vegetable production and marketing**, P. WORK (*New York: John Wiley & Sons; London: Chapman & Hall, 1945, pp. 559+, illus. 187*)—This textbook on production management, and marketing of vegetable crops is primarily for students and teachers of agriculture in high schools, technical institutes, junior colleges, and colleges.

**The conservation of natural resources**, H. B. WALES and H. O. LATHROP (*Chicago, Ill.: Laurel Book Co., 1944, pp. 554+, about 200 illus.*)—A textbook for junior and senior high schools covering the conservation of forests, soils and agriculture, range lands, water resources, wildlife, mineral resources, and recreational, scenic, and historical resources; and the carrying of conservation into effect.

**Seaman A. Knapp: Schoolmaster of American agriculture**, J. C. BAILEY (*New York: Columbia Univ. Press, 1945, pp. 307, illus. 1*).—This biography discusses in part 1 (pp. 1-132) Dr. Knapp's early years under the heading of The Making of a Teacher and an Agriculturalist, including his services at the Iowa State College. Part 2 (pp. 133-244) discusses the founding of the county agent system, in particular the organization and growth of the Farmers' Cooperative Demonstration Work. Part 3, The Institutionalization of an Individual (pp. 244-280), deals with the passage of the Smith-Lever Act, regarding which it is claimed that "he was originator of the idea, organizer of the details of structure and operation, and principal engineer of the forces of opinion and political energy which secured its passage."

## FOODS—HUMAN NUTRITION

**Food for the family: An elementary college text**, J. S. WILMOT and M. Q. BATJER (*Chicago: J. B. Lippincott Co., 1944, 2 ed., rev., pp. 748+, illus. 150*).—This text has been completely revised and rewritten (E. S. R., 80, p. 846), in the light of recent developments in the field of nutrition and from the viewpoint of changes in food supply brought about by the war. Much of the material has been expanded and reorganized, and additional illustrations have been included. The laboratory problems and recipes have been entirely reset to make them more practical and more easily used, both in the class and in the home; recipes of relatively low cost have been given increased emphasis; and rationing has been considered in the choice of some of the recipes.

**Manual for the study of food habits** (*Bul. Natl. Res. Council, No. 111 (1945), pp. 142+*).—The stated purpose of this manual, which has a foreword by M. L. Wilson and a preface by C. E. Guthe, is "to set up preliminary standards for the collection of basic data on food habits which any study, whether pursued from the standpoint of psychology, psychiatry, sociology, anthropology, or home economics, should be responsible for recording or systematically taking into account." Parts I to IV, inclusive, covering the introduction, the approach of the manual, the context for the collection of data, and some technics which have been used in observational studies of food habits, have been contributed by M. Mead, executive secretary of the Committee on Food Habits; and Parts V and VI, dealing with experimental methods in the field of food habits and with suggestions of source material for research workers in the field, by P. Woodward, associate executive secretary of the committee. The bibliography of 682 references was selected to provide orientation in the problems of food habits and the methods and technics used to study them. References to studies in the United States are more complete than those of other countries, the latter being selected as of historical, theoretical, or methodological interest. Use of the bibliography is facilitated by a partial index.

**Dietotherapy: Clinical application of modern nutrition**, edited by M. G. WORL (*Philadelphia & London: W. B. Saunders Co., 1945, pp. 1029+, about 100 illus.*).—This book, written to provide the practicing physician and the student of

medicine with a sound knowledge of current advances in and practical applications of nutrition, is presented in three parts dealing, respectively, with normal nutrition, nutrition in periods of physiologic stress (pregnancy, growth, etc.), and nutrition in disease. The subject matter covered by a total of 58 contributors includes discussion of the following subjects in parts 1 and 2: The Normal Diet, by J. S. McLester (pp. 1-10); The Physiology of the Gastro-Intestinal Tract and Its Bearing on Nutrition, by F. C. Mann and J. L. Bollman (pp. 11-35); Water Metabolism, by J. H. Austin (pp. 35-42); The Role of Carbohydrate in the Diet, by S. Soskin and R. Levine (pp. 42-61); The Role of Fat in the Diet, by G. O. Burr (pp. 62-82); The Role of Protein in the Diet, by M. Spiegel-Adolf (pp. 83-97); Iron and the Essential Trace Elements, by C. V. Moore (pp. 98-120, 141-145); Iodine, by W. T. Salter (pp. 120-141, 145-146); Calcium and Phosphorus, by J. O. Holmes (pp. 147-188) (Mass. State Col.); Tracer Substances in Nutrition, by W. T. Salter (pp. 188-207); Vitamin A in Health and Disease, by L. E. Booher (pp. 207-235); Thiamin, Nicotinic Acid, Pyridoxin, Pantothenic Acid, Biotin, Para-Aminobenzoic Acid, Other Components, by B. Sure (pp. 237-258, 283-287) (Univ. Ark.); Riboflavin and Its Clinical Application, by W. H. Sebrell (pp. 258-263, 287-288); The Clinical Possibilities of Pantothenic Acid, by R. J. Williams (pp. 263-267, 288-289); Choline Metabolism, by A. White (pp. 267-283, 289-291); Vitamin C in Health and Disease, by G. Dalldorf (pp. 291-305; Vitamin D in Health and Disease, by D. J. McCune (pp. 305-334); Vitamin E in Health and Disease, by J. H. Jones (pp. 334-345); Vitamin K, by J. F. Weir (pp. 345-360); Vitamin Interrelationships, by B. Sure (pp. 360-364) (Univ. Ark.); The Relation of Vitamins to Oxidative Enzymes, by J. H. Jones (pp. 365-377); The Laboratory Diagnosis of Vitamin Deficiency, by H. Field, Jr., (pp. 378-383); Roentgen Signs of Nutritional Deficiencies, by B. P. Widmann (pp. 384-402); Nutrition, Income, and Budgeting, by R. M. Leverton (pp. 402-435) (Univ. Nebr.); Problems of Improving Nutrition in Industry, by R. S. Goodhart (pp. 435-447) (U. S. D. A.); Nutrition in Pregnancy, by P. F. Williams (pp. 448-472); Nutrition in Infants and Children, by W. E. Nelson and N. Kendall (pp. 473-505); Nutrition in the Aged, by J. H. Musser (pp. 505-515); Nutrition in Relation to Infection and Immunity, by J. A. Kolmer (pp. 515-524); Nutrition and the Athlete, by E. R. Yoemans (pp. 525-530).

A comparison of measurement of juiciness in roast pork loin by press-fluid and jury-rating methods, F. HARDY and I. NOBLE. (Minn. Expt. Sta.). (*Food Res.*, 10 (1945), No. 2, pp. 160-164).—Four series of 108 roasts each were studied. The roasts were stored at -18°, -12°, and -9° C. for periods of from 2 to 33 weeks before roasting. After cooking, the samples were scored by four to five judges. A statistical treatment of the results obtained indicated that although the correlation coefficients between percentage of press fluid and judges' scores on juiciness varied from 0.32 to 0.51 for the four series (which was considered highly significant), they were too low to make it practicable to predict judges' scores on juiciness on the basis of the press-fluid determinations.

Effect of storage temperature and time upon quality of pork preserved by freezing, I. NOBLE and F. HARDY. (Minn. Expt. Sta.). (*Food Res.*, 10 (1945), No. 2, pp. 165-175, illus. 1).—Pork loin roasts were stored and held at temperatures and time intervals described in the previous article. No appreciable differences were found in the palatability of the roasts due to the different temperatures of storage (-18°, -12°, -9° C.). However, desirability—based upon aroma, flavor of lean, and flavor of interior and exterior fat—decreased progressively, so that after 16 to 22 weeks the product might no longer be considered even "slightly desirable." Greatest deterioration on prolonged storage occurred in aroma and flavor of the fat; the flavor of the lean deteriorated at a moderately slow rate, while the intensity factors, tenderness, and juiciness were practically unaffected.

**Hydrogen-ion concentration of thick and thin white of eggs,** J. L. ST. JOHN. (Wash. Expt. Sta.). (*Arch. Biochem.*, 5 (1944), No. 1, pp. 71-76).—H-ion determinations using the Bailey electrode or the Beckman pH meter were made, soon after breaking the eggs, on the thick and the thin portions of the egg white separated by pouring from a beaker to a watch glass and back several times. Measurements were made on fresh eggs, less than an hour old, and on those stored under different conditions and for different lengths of time. In the fresh egg the initial pH varied over a fairly wide range, but centered around 8.0. In most instances the thick and thin portions of fresh egg white differed in pH, and apparently equilibrium was not established; although there was little or no difference between thick and thin after 5 weeks' storage this condition did not maintain, and after 2 years' storage there was again a difference between the thick and thin portions, the pH reading of the thin being 9.00 and of the thick 8.72. After 3 years' storage the pH value was 8.01, and no separation of thick and thin portions could be made. Evidence is presented indicating that loss of CO<sub>2</sub> may not be the explanation of the increase in pH which occurs upon standing.

**Importance of breeding peas and corn for nutritional quality,** G. C. SCOTT and R. O. BELKENGREN (*Food Res.*, 9 (1944), No. 5, pp. 371-376).—Vitamin determinations were made on special breeding lines of peas and corn which were raised under identical conditions on a light sandy loam with adequate fertilization. In general, analyses were made on samples taken from harvests closest to canning maturity. Assays were begun within 2 hr. after collecting the sample from the field. Results showed that carotene in peas could vary more than 300 percent. A minimum value of 1.09 µg./gm. and a maximum of 5.32 µg./gm. were found in the assay of nearly 100 samples. An increase of carotene with increasing maturity was noted (from 1.75 to 3.51 µg./gm.), while only slight effect was found on the ascorbic acid content under the same conditions. Variations in ascorbic acid with different strains of peas were marked, with minimum and maximum values of 121 and 337 µg./gm., respectively. Variations in thiamine content were also considerable, ranging from 1.37 to 4.29 µg./gm. in the 16 strains tested. Niacin and riboflavin values in peas were relatively constant, ranging from 27.7 to 35.1 µg./gm. for niacin and from 1.72 to 2.57 µg./gm. for riboflavin. Similar carotene and ascorbic acid studies on 22 types of inbred golden sweet corn showed a marked increase in carotene and a slight decrease in ascorbic acid with increased maturity of the corn. Values ranging from 0.81 to 7.73 µg./gm. for carotene and from 104 to 270 µg./gm. for ascorbic acid were noted. A study of 45 hybrids from the above inbred corn strains gave smaller ranges, 1.65 to 4.60 for carotene and 99 to 180 for ascorbic acid.

**Sprouted cowpeas as a source of protein and vitamins,** W. D. GALLUP and R. E. REEDER. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.*, 24 (1944), pp. 53-55).—Chinese Red cowpeas (*Vigna sinensis*) and Dwarf Green mung beans (*Phaseolus aureus*) were sprouted between wet pads in 8-in. flowerpots at temperatures ranging between 70° and 80° F. Sprouts 2- to 4-in. long developed in 96 hr. Peanuts yielded unsatisfactory results under similar conditions. Fifty-gm. samples of the legumes yielded 130 gm. of cowpea and 200 gm. of mung bean edible fresh sprouts containing about 85 percent moisture. The total dry matter recovered in the sprouts amounted to about half that originally present in the dormant seed. Ascorbic acid values in the sprouted legumes were 131 mg. and 128 mg. per 100 gm. dry matter for cowpeas and mung beans, respectively. Proximate composition analysis indicated that the protein content (on a dry weight basis) increased from the dormant to the sprouting legume from 25.0 to 31.0 percent in cowpeas and from 26.5 to 35.4 in the mung beans.

**Chemical composition of grape juices: A varietal study**, J. E. WEBSTER and F. B. CROSS. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.*, 24 (1944), pp. 92-95).—Forty-four varieties of grapes grown at Henryetta in 1931-34 and 27 varieties grown at Stillwater during 1935 were prepared as juice by crushing and heating to 100° F., pressing, and filtering. The juice from each variety was placed in a quart can, sealed, and pasteurized at 185° for 5 min., and stored 2 to 5 mo. before analysis. The chemical composition in terms of reducing sugars and total sugar content; acidity; tannins, nontannins, and total astringency; density; and acid-sugar ratio of these juices is presented in tabulated form.

**Variations in acidity of Concord grape juice**, D. R. MCCORMICK, M. K. VELDHUIS, and J. L. ST. JOHN. (Wash. Expt. Sta. coop. U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1944), No. 4, pp. 101-102, 125).—Twelve samples of bottled pasteurized Concord grape juice (2 of which had been detarted) were obtained from four widely separated areas of the United States. Analyses were made for free tartaric acid, cream of tartar, total tartaric acid, malic acid, Brix, pH and ash—following approved technics. Results showed pH values ranging from 3.01 to 3.51, and Brix readings (20° C.) varied from 15.6° to 18.9°. Acidity values, expressed in grams per 100 cc., ranged as follows: Titratable acidity 0.56 to 0.95, cream of tartar 0.34 to 0.75, free tartaric acid none to 0.26, and malic acid 0.22 to 0.44. The free malic acid values were considered to show "wide variation" and to be responsible for the largest proportion of the titratable acidity in the final product. Variations in free tartaric acid were also considerable. The differences in acidity of grape juices are attributed to this fluctuation of these two acids (malic and free tartaric). When both the values were high, the juice had a sour taste; when both were low the juice had a mild taste. The authors discuss the various possibilities of blending and of the processing required to obtain a uniform product.

**Foods which have been frozen** (*Quick Frozen Foods*, 7 (1945), No. 9, pp. 50, 52).—A previous list (E. S. R., 92, p. 438) is reprinted with additions. It is pointed out that not all of the products listed have been commercially frozen as yet, but that laboratory tests have been conducted on all, and many are available on the market or will be when production is feasible.

**Freezing of apple juice**, J. FORGACS, W. A. RUTH, and F. W. TANNER. (Univ. Ill.). (*Food Res.*, 10 (1945), No. 2, pp. 148-159, illus. 1).—As recently pressed apple juice is sometimes frozen and later thawed and sold as fresh juice, this experiment was undertaken to study effects of alternately freezing and thawing upon the pH, total titratable acidity, refractometer reading, and number and types of microflora in various apple juices frozen in gallon jars. Juices constantly frozen for an extended period of time were used for comparison. Golden Delicious, Grimes Golden, Jonathan, Willowtwig, Winesap, and Delicious varieties were used. Juice was obtained from No. 1 apples and from defective apples previously sorted on the basis of scab lesions, worm entrances, stings, and size and color.

In general, there was an increase in acidity and H-ion concentration in all samples; the refractometer reading, which is the percentage of soluble solids (a rough estimate of percentage sugar), decreased; the death rate of micro-organisms was more rapid in juices thawed for 17 hr. every 2 weeks and refrozen than in juices thawed for 24 hr. every week and refrozen. Absolute sterility was obtained in only a few cases, although the total number of micro-organisms decreased greatly in the more acid juices. Most juices which were thawed and refrozen were unsuitable for human consumption when the investigation was discontinued.

[**Nutrition investigations**] (*Connecticut [New Haven] Sta. Bul.* 484 (1945), pp. 93-94).—Preliminary results of this study, carried out as part of an investigation of the role of citric acid in bone formation, indicate that there are wide variations

in the citric acid content of bones of animals of the same age and nutritional history. Bones of rats fed a rachitogenic diet showed a relatively low citric acid content in contrast to those from animals that had been fed either citrates or vitamin D to prevent or cure rickets. Citric acid was found present in very small amounts in rat liver, spleen, and kidneys, and in relatively large amounts in the adrenals. Chick tibias also varied in citric acid content. Chicks that received no vitamin D showed low calcification and low citric acid, while chicks fed an adequate amount of vitamin D showed a much higher bone content of citric acid.

Growth, reproduction, and lactation in rats maintained through four generations on highly purified diets, L. J. VINSON and L. R. CERECEDO (*Arch. Biochem.*, 3 (1944), No. 3, pp. 389-397, illus. 4).—The diet most frequently used consisted of purified casein 30 percent, salt mix 5, Ruffex ( $\alpha$ -cellulose preparation) 2, lard 5, Crisco 5, and sucrose 48 percent. Supplements of thiamine, riboflavin, pyridoxine, calcium pantothenate, choline chloride,  $\alpha$ -tocopherol, and vitamin A and B concentrates were added. Four generations of rats were raised on this type of diet, and the average weaning weight of the young compared favorably with the control rats raised on Purina dog chow. However, the number of rats weaned and the average litter size decreased progressively. During lactation it was noted that the mother invariably lost weight, the average loss being 40 gm. for Wistar strain animals and somewhat less for those of the Evans-Long strain. The authors were able to prevent this weight loss by feeding brewers' yeast (500 mg./day). Somewhat comparable results were obtained when a folic acid concentrate was used. Casein, sucrose, lard, biotin,  $\beta$ -aminobenzoic acid plus inositol, and yeast nucleic acid were all ineffective in preventing this loss of weight in lactating mothers.

**Animal colony maintenance** (*Ann. N. Y. Acad. Sci.*, 46 (1945), pp. 1-126, illus. 6).—Papers and discussions presented at the conference on problems involved in animal colony maintenance held by the section of biology of the New York Academy of Sciences, November 10-11, 1944, dealt especially with the following topics: Genetic Purity in Animal Colonies, by F. B. Hutt (pp. 5-21) (Cornell Univ.); The Mating of Mammals, by C. G. Hartman (pp. 23-44 (Univ. Ill); Feeding Laboratory Animals, by J. K. Loosli (pp. 45-75) (Cornell Univ.); Infectious Diseases of Laboratory Animals, by H. L. Ratcliffe (pp. 77-96); Influence of Environmental Temperatures on Warm-Blooded Animals, by C. A. Mills (pp. 97-105); Animal Colony Maintenance—Financing and Budgeting—View-point of the University, by S. Farber (pp. 107-113); and Animal Colony Maintenance—Financing and Budgeting; View-point of Commercial Breeder, by C. N. W. Cumming and F. G. Carnochan (pp. 115-126). Introductory remarks were made by E. J. Farris.

**Errors in applying nutrient allowances to dietary surveys or food policies**, L. B. PERT (*Canad. Jour. Pub. Health*, 36 (1945), No. 2, pp. 69-73, illus. 4).—Errors are pointed out which may result from interpreting dietary standards in terms of foods and in terms of national and international food requirements and agricultural policies. One error is concerned with the question as to whether the present "recommended dietary allowances" (r. d. a.) are set too high in some respects. The other error is concerned with the range of values around the level needed to satisfy the individual variation in any normal population. Present standards are set up to allow for unknown factors (margin of safety) and to include that small percentage of people requiring high intakes. Graphic representation of the differences between standard values applicable to 50 percent or more of the subjects tested and the r. d. a. show that for a normal population group the mode or average individual requirement is generally one-half or less than that given as the r. d. a. The author emphasizes the need for considering the bases and meanings of figures for nutrient requirements in relation to (1) how far the level for optimum nutrition varies from the level protecting against disease, and (2) what

is the range of individual requirements which exists at the level chosen. This range should be considered in interpreting dietary surveys and in calculating national food supplies.

**Outline of the amino acids and proteins**, edited by M. SAHYUN (*New York: Reinhold Pub. Corp., 1944, pp. 251, about 25 illus.*).—This book, offered as an elementary text, without attempt to cover all phases of the subject or to treat any subject exhaustively, outlines in simple and readable manner the essentials of the chemistry and the biochemistry of amino acids and proteins. The following phases of the subject are considered: Discovery of the Amino Acids, by M. Sahyun (pp. 13-40); Proteins: Occurrence, Amino Acid Content, and Properties, by C. L. A. Schmidt (pp. 41-72); Protein Structure, by H. B. Bull (pp. 73-83); Hydrolysis of Proteins, by M. Sahyun (pp. 84-93); Synthesis and Isolation of Certain Amino Acids, by H. E. Carter and I. R. Hooper (pp. 94-114) (Univ. Ill.); Methods of Analysis for Amino Acids and Proteins, by D. M. Greenberg (pp. 115-151); Relation of Amino Acids and Their Derivatives to Immunity, by M. Heidelberger (pp. 152-157); Relation of Amino Acids to Biologically Important Products and the Role of Certain Amino Acids in Detoxication, by A. J. Quick (pp. 158-178); Metabolism of Proteins and Amino Acids, by W. M. Cahill (pp. 179-196); Intermediary Metabolism of Individual Amino Acids, by W. M. Cahill (pp. 197-216); Nitrogen Equilibrium and the Biological Value of Protein, by W. M. Cahill and A. H. Smith (pp. 217-220); and Amino Acids and Proteins in Nutrition, by M. Womack and C. F. Kade (pp. 221-236) (Univ. Ill. et al.).

The nutritional significance of amino acids and proteins, M. SAHYUN (*Amer. Jour. Digest. Diseases*, 12 (1945), No. 3, pp. 80-85).—A general review of the subject is presented, covering the historical background, recent knowledge, and pertinent application of that knowledge to present-day problems. The author has tabulated the essential amino-acid content of various tissue proteins, and refers to classical experiments, which determined the protein requirements of the individual in terms of nitrogen balance, and to the indispensability of certain amino acids for various experimental animals and man.

The effect of the nature and level of protein and amino acid intake upon the accumulation of fat in the liver, J. M. R. BEVERIDGE, C. C. LUCAS, and M. K. O'GRADY (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 9-19).—Two series of young adult rats were used to determine the proportions of gelatin (nonlipotropic) and casein (lipotropic) needed (at a 20 percent protein level) on a high-fat diet (40 percent beef drippings) adequately supplemented with vitamins to just maintain body weight without lowering liver fat. Results indicated that a casein-gelatin ratio of 8 : 12 was adequate.

Using these findings as a basis, further experiments were made, to determine whether the lipotropic action of casein could be attributed to its content of methionine and cystine alone. Two series of rats weighing from 110 to 160 gm. and 230 to 270 gm., respectively, were fed for 28 and 21 days, respectively, one of six basal diets varied as follows: (1) containing 20 percent gelatin; (2) 8 percent casein plus 12 percent gelatin; (3) 19.7 percent gelatin plus 0.25 percent methionine and 0.034 percent cystine (estimated as equivalent to the amounts of these amino acids in the casein); (4) 18.7 percent gelatin plus 0.25 percent methionine, 0.034 percent cystine, and 0.8 percent of a mixture of valine, threonine, and isoleucine plus 0.16 percent tryptophan (the latter to compensate for these amino acid deficiencies in the gelatin); (5) 4 percent casein plus 16 percent gelatin; and (6) 19.8 percent gelatin plus 0.13 percent methionine and 0.017 percent cystine.

Tabulated results showing the liver-fat content developed on these high-fat diets indicated that the nature and level of protein intake markedly affected the liver fat of the rats. The adequacy of essential amino acids in the diet appeared

to be an important factor in the lipotropic effect of methionine. No significant difference was noted in the lipotropic effect exerted by methionine when fed as the free amino acid or in casein, provided the essential amino acids were approximately equalized in the two diets.

**Environmental temperature and protein requirement.** C. A. MILLS (*Arch. Biochem.*, 3 (1944), No. 3, pp. 333-336).—This is a continuation of the author's experiments on the effect of high temperatures upon nutritional requirements (E. S. R., 90 p. 713). Synthetic diets composed of vitamin-free casein, sucrose, corn oil, salts, and necessary vitamins were fed to weanling male rats held at 91° and 68° F. The casein in the diet varied from 6 to 36 percent. Best growth at 68° was attained on the 18-percent level, while higher levels were necessary at 91° until additional cystine was included. The author concludes that "slightly higher percentages of dietary protein are needed in the heat, however, although the total daily protein intake is actually lower. Fortification of the diet with cystine (0.2 percent) lowers the amount of protein needed for optimal growth in both heat and cold, and it seems to eliminate the need of a higher protein percentage for optimal growth in the heat."

**Biological values and true digestibilities of some food proteins determined on human subjects.** J. R. MURLIN, L. E. EDWARDS, and E. E. HAWLEY (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 785-786).—Using from 7 to 11 human subjects, the biological value of several proteins was determined in relation to the endogenous nitrogen excretion found on a no-protein period of 3 days just preceding the diet containing the test protein. The following biological values for the proteins tested were indicated: Whole egg 97 (range 92-100), soybean 81 (72-92), beefsteak 84 (72-93), peanut 83 (67-95), "kitchen food" yeast 87 (76-96), and cottonseed 91 (range 82-103). "True digestibility" found for these six proteins was respectively, 96, 89, 97, 93, 87, and 78. The authors conclude that true digestibility does not determine biological value, nor does nitrogen balance correctly indicate the true food value of a protein so convincingly as does the determination of biological value in the technical sense, biological value being defined as the percentage of the absorbed nitrogen which is retained for synthesis of body protein.

**An iron-protein complex obtained from liver.** B. LIBET and K. A. C. ELLIOTT (*Jour. Biol. Chem.*, 152 (1944), No. 3, pp. 613-615).—A brief description is given of the method used to prepare a new iron-protein complex ("ferrin") from liver. Fresh liver (rat, rabbit, guinea pig, pig, or beef) was homogenized with 2 volumes of water, heated in a water bath to 90° [C.], strained, and filtered. Sufficient 3 N HCl was added to the liquid to lower the pH to 2.5, and the precipitate thus formed was centrifuged, washed, and dried in vacuo. This reddish brown acid precipitate contained 6.3 percent iron. Partial purification was accomplished by redissolving the precipitate and reprecipitating with ammonium sulfate at pH 7.1, followed by dialysis. The final preparation (ferrin) contained 15.7 percent iron and differed from "ferritin" in several ways. The authors suggest that ferrin may be a denatured product, as heat is involved in its preparation. The theory is advanced that much of the nonhemin iron in liver may be present in the form of ferrin or a related product, in view of its high catalytic activity, iron content, and solubility in neutral or alkali solutions.

**A note on the amino acids yielded by yeast, sunflower seed meal, and sesame seed after hydrolysis of the fat free tissue.** R. J. BLOCK and D. BOLLING (*Arch. Biochem.*, 6 (1945), No. 2, pp. 277-279).—The principal amino acid values are listed and compared with analyses of casein and chopped beef previously reported (E. S. R., 92, p. 753). The authors imply that controversial reports on the nutritive value of yeast proteins may be due to variations in the amino acid composition of the yeasts studied or difficulty in digestibility. The yeast used in the present study appeared to contain amino acids in balanced proportion and to be well digested by pancreatin.

Sunflower seed proteins were found to be lower in lysine, but richer in cystine and methionine, than the yeast proteins. Sesame seed proteins showed a tryptophan value (1.8 percent) significantly higher than the other proteins listed (1.2-1.3 percent).

The inhibition of the succinoxidase system using cysteine and cystine, II, III, S. R. AMES and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Soc. Expt. Biol. and Med. Proc.*, 57 (1944), No. 1, pp. 108-111, illus. 1; 58 (1945), No. 1, pp. 52-55, illus. 1).—In continuation of this study (E. S. R., 93, p. 3), two papers are presented.

II. *Nature of inhibiting substance*.—The presence of cystine in the succinoxidase system used and under the conditions employed in the experiments described was found to inhibit the action of the succinoxidase. The tests did not differentiate between the dimer and the free radical.

III. *Effect of dialysis*.—Dialysis removed much extraneous material and a considerable portion of the interfering four-carbon dicarboxylic acids (C-4) present, but inhibition approaching 100 percent could not be obtained under the experimental condition used. The authors concluded that (1) the inhibition of the succinoxidase system by cystine could be increased by dialysis of the tissue homogenate, and (2) temperatures above 0° C. and dilution of the tissue homogenates (below 10 percent) favor the spontaneous inactivation of the system.

Effect of wheat germ on creatinuria in dermatomyositis and progressive muscular dystrophy, A. T. MILHORAT, V. TOSCANI, and W. E. BARTELS (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 1, pp. 40-41).—"The administration of large amounts of fresh wheat germ which was vacuum packed and sealed reduced the creatinuria in three patients with dermatomyositis. Other samples of wheat germ, stored in bulk, were ineffective. In another subject with progressive muscular dystrophy the creatinuria was diminished in one experiment and unaffected during a second period of wheat germ feeding. Wheat germ incubated in vitro with normal human gastric juice had more effect on creatinuria than had the fresh product. Prolonged extraction with ethyl ether reduced but did not remove completely the factor or factors in wheat germ that lower output of creatine. On the other hand, wheat germ defatted by extraction with ethylene dichloride was entirely without effect on the creatinuria. Of various vitamins and other substances investigated, only soybean lecithin reduced the creatinuria."

The effect of dietary choline upon the rate of turnover of phosphatide choline, G. E. BOXER and D. STETTEN, Jr. (*Jour. Biol. Chem.*, 153 (1944), No. 2, pp. 617-625, illus. 2).—The studies of Jacobi and Baumann (E. S. R., 86, p. 420; 87, p. 889) demonstrated that on a choline-poor diet severe fatty liver and hemorrhagic kidney lesions could occur in rats while the body level of choline remained normal. The present work is an attempt to study the rate of conversion of dietary or synthesized choline into the body phosphatides of the rat and the effect of the level of dietary choline upon this rate. The technic employed has been "to follow the appearance of N<sup>15</sup> in the choline of the liver and carcass phosphatides of rats kept on a high fat diet amply supplemented with choline labeled with heavy nitrogen but otherwise poor in lipotropic factors; then, to follow the disappearance of isotope from these same fractions in the surviving animals during a subsequent period of choline deprivation....

"When choline was fed, the half life of phosphatide choline was about 6 days, and the daily replacements of choline in the phosphatides, 3.9 mg per rat. When no choline was fed, while the rats were developing severe fatty livers, the half life of choline increased to 18 days, and the daily replacement decreased to 1.3 mg. The effect of choline deprivation has been markedly to retard the rate of incorporation of new choline into the phosphatides of the body without altering the quantity of choline in the phosphatides. It is proposed that the appearance of fatty liver is

referable to this change in the rate at which dietary or freshly synthesized choline enters the body phosphatides."

**Production and release of nicotinamide by the intestinal flora in man.** P. ELLINGER, R. A. COULSON, and R. BENESCH (*Nature [London]*, 154 (1944), No. 3904, pp. 270-271).—This preliminary report is a brief presentation of experiments on the influence of doses of succinyl-sulfathiazole, sulfaguanidine, or sulfathiazole on nicotinamide methochloride ( $F_2$ ) output. The important results noted are as follows: A sharp reduction of  $F_2$  elimination occurs during dosing with succinyl-sulfathiazole and sulfaguanidine; this reduction is greatest with succinyl-sulfathiazole and amounts to an average of 70 percent in healthy and 95 percent in pellagrific subjects. No significant changes occurred when sulfathiazole was administered. The response to nicotinamide (given at the end of the dosing period) varied with the mode of administration, better response being obtained with subcutaneous injection than by oral dose. The authors interpret the marked reduction of  $F_2$  output during the administration of succinyl-sulfathiazole and sulfaguanidine as an impairment of the normal mechanism of synthesis and release of the vitamin by bacterial flora.

**Enzymatic studies on tissues of rats fed purified rations containing succinyl-sulfathiazole.** F. J. PILGRIM and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Arch. Biochem.*, 6 (1945), No. 1, pp. 121-129).—"The enzymes metabolizing pyruvate and fumarate in the livers of rats fed purified rations containing sulfasuxidine (succinylsulfathiazole) have only 20 to 40 percent of the normal activity. Feeding solubilized liver for 1 to 2 weeks after the rats have been on the basal ration for 7 to 9 weeks causes these systems to return to normal activity and reverses the growth inhibition. Evidence is presented to indicate that the decrease in activity is caused by an inhibitory substance accumulating in the liver. The decreases in succinoxidase, malic oxidase, and cytochrome oxidase noted in some animals can be attributed to the hepatic injury occurring in these animals. No enzymatic change can be attributed directly to a nutritional deficiency on the basis of the experiments reported here. The properties of the inhibitor suggested and subsequent analysis proved that it was an excess of calcium."

**The carotene and ascorbic acid concentration of vegetable varieties.** L. P. PEPKOWITZ, R. E. LARSON, J. GARDNER, and G. OWENS. (R. I. Expt. Sta.). (*Plant Physiol.*, 19 (1944), No. 4, pp. 615-626, illus. 2; abs. in *Amer. Soc. Hort. Sci. Proc.*, 44 (1944), p. 468).—The material presented has been noted from an earlier condensed report (E. S. R., 92, p. 449).

**Factors in the destruction of ascorbic acid and carotene in kale.** G. M. GILLIGAN and C. W. WOODMANSEE (*Delaware Sta. Pam.* 16 (1945), pp. 5+).—Preliminary results in this study of vitamin losses in the handling of green, leafy vegetables between picking and consumption served as helpful guides in the matter of sampling procedures and gave some indication of expected losses in the freezing and cooking of raw and frozen samples. For the raw material, a 2-bu. field sample of Dwarf Siberian kale was subsampled to obtain from 6- to 8-in. leaf blades from leaves freed of petioles. From this subsample, after washing the leaves, swinging them in cheese cloth, and drying in toweling, three 25-gm. aliquots were required for the ascorbic acid determination. For carotene, subsampling to obtain a uniform aliquot of working size (10 gm.) was facilitated by quick freezing of a 1-lb. raw sample and grinding it in the frozen state in a Russwin food chopper. Freezing of the raw kale was followed by no loss of carotene, but serious loss of ascorbic acid resulted. Kale heavily frosted in the field likewise suffered loss of ascorbic acid, and there was apparently no reconstitution of the ascorbic acid as a result of cooking.

Blanching of fresh kale resulted in about a 40-percent loss of ascorbic acid but an apparent gain in carotene. With storage for 4 mo. at 0° F., blanched, frozen

kale lost no ascorbic acid but showed an appreciable (44 percent) unexplained loss of carotene. Cooking of the kale held frozen for 2 and 4 mo. resulted in losses of about 22 and 18 percent of the ascorbic acid in the frozen products, respectively; these losses calculated back to the fresh, wet basis amounted to about 56 percent of the ascorbic acid originally present in the fresh, raw kale. The presence of glassy phosphates at 1- or 2-percent level afforded appreciable protection against destruction both in the boiling of aqueous solutions of ascorbic acid and in the cooking of spinach. The presence of copper in the former tests appreciably decreased the protective action.

**Changes in carotene and starch during blanching and dehydration,** T. E. WEIER. (Univ. Calif.). (*Quick Frozen Foods*, 6 (1944), No. 8, pp. 79, 84, illus. 1).—Essentially noted elsewhere (E. S. R. 92, p. 580).

The carotene content of the grain sorghums, W. GROSS and V. G. HELLER. (Okla. A. and M. Col.). (*Okla. Acad. Sci. Proc.*, 24 (1944), pp. 97-98).—Twenty-eight varieties of grain sorghums grown under two different soil and climatic conditions were analyzed for carotene. Values ranged from 1.2 to 5.16 µg. per gram. The average amount is considered low, about one-half that found in yellow corn.

**Effect of mineral deficiencies on the carotene content of vegetables grown in the greenhouse,** D. H. BROWN, R. D. SCHULKERS, and M. R. SHETLAR. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 44 (1944), pp. 462-464).—Lettuce, kale, mustard, beet tops, and spinach were tested in plots composed of cinders, haydite, and gravel, supplemented with the necessary trace elements (Fe, Cu, Mn, Zn, and B). Nutrient solutions containing adequate or inadequate amounts of nitrogen, postassium, phosphorus, calcium, and magnesium were added. The most typically starved leaves were harvested and assayed for carotene according to the authorized A. O. A. C. method (1940).

Results indicated that any lack of fertilizing material which reduced the green color of the foliage reduced the carotene content. Inadequate amounts of nitrogen, calcium, potassium, and magnesium caused, with few exceptions, yellowing of the leaves and low carotene values. Lack of phosphorus produced plants slightly stunted in growth, but with dark green leaves and high carotene values, kale averaging as much as 19,730 International Units per 100 gm., mustard 19,200, and beet tops 18,300 I. U. per 100 gm.

**Carotene, flavor, color, and refractive indices of carrots grown at different fertility levels,** H. D. BROWN, M. K. MILLER, K. ALBAN, R. SIORT, R. SCHULKERS, and C. MURNANE. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 44 (1944), pp. 465-467).—Chantenay carrots grown on specially fertilized plots, with certain minerals (K, N, or P) omitted or doubled, developed a bitter taste. During the experiments these carrots had their foliage severely infected with *Macrosporium carotae*, and the tops were later removed about 2 mo. prior to harvesting. Tests were made on the refractive indices, color, taste, and carotene content of these carrots compared with some late-grown Chantenay and Nantes varieties and some "shipped in" carrots. No definite correlation between the bitter principle and the test results could be found. In general, carrots with the poorest taste contained more xanthophyll, although the shipped in carrots with a poor color and low carotene content had an excellent flavor. The refractive indices of the late planted and shipped in carrots were noticeably higher than those of the early planted carrots, and only one floater was noted in the whole lot. The authors noted that the floaters always had lower refractive indices than the heavier carrots. In averaging all the lots, there was a positive correlation between high refractive index and desirable taste  $0.626 \pm 0.079$ . The authors concluded that something other than soluble solids as measured by the refractive index was influencing the taste, as indicated by the judges. Judgment was surprisingly consistent throughout the experiment.

**Effect of storage conditions and type of container on stability of carotene in canned vegetables,** J. E. W. McCONNELL, W. B. ESSELEN, JR., and N. GUGGENBERG. (Mass. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 5, pp. 133-135).—Experimental packs of asparagus, green beans, peas, and corn were packed according to standard commercial procedures, using No. 303 size glass jars sealed with vapor-vacuum caps or No. 2 tin cans. The vegetables were canned a few hours after harvest, each container of the same type being filled with the same amount of weighed vegetable, then filled with hot brine to give a uniform head space and initial temperature comparable to that used in commercial practice. Tin and glass containers were given the same thermal treatment by processing them together. Storage was at room temperature (70°-80° F.), with the glass-container pack exposed to bright sunlight, diffused light, or darkness. The carotene content of the vegetables was determined by the methods of Peterson (E. S. R., 87, p. 7), before and after blanching, immediately after canning (the drained solids and liquid being analyzed separately), and after storage of the canned product for various intervals up to 9 mo.

Comparison of the carotene contents (dry weight basis) of raw and blanched vegetables suggested a slight loss of carotene by snap beans and peas in the blanching process and an apparent gain by asparagus and corn. Results, expressed as total carotene content per container, showed that processing losses in glass-packed asparagus and snap beans were 5 and 13 percent, respectively, compared with the blanched product, whereas no appreciable loss of carotene was noted with the vegetables packed in tin; the processed corn sample showed an apparent increase in carotene over the comparable blanched product. In storage there was an increase in carotene content of asparagus, a loss in some of the beans, and a loss in corn. The authors were not able to explain the apparent increases in carotene content; however, they reaffirm from these experiments that the original carotene content of fresh vegetables is stable during canning and storage.

**Stereochemical configuration and provitamin A activity, I-III** (*Arch. Biochem.*, 5 (1944), Nos. 1, pp. 107-114, illus. 1; 3, pp. 365-371, illus. 1; 6 (1945), No. 1, pp. 157-161, illus. 1).

I. *All-trans-β-carotene and neo-β-carotene U*, H. J. Deuel, Jr., C. Johnston, E. Sumner, A. Polgár, and L. Zechmeister.—A detailed study is presented comparing the relative provitamin A efficiencies of natural (all-trans-)  $\beta$ -carotene and neo- $\beta$ -carotene U in the rat. Bioassays were made according to the U. S. P. XII methods with the exception of a slight change in the depletion period (17-18 days instead of 20 days). Negative controls indicated that the basal diet used was essentially vitamin A-free. When several levels of neo- $\beta$ -carotene U were compared with  $\beta$ -carotene, results indicated that this crystalline stereoisomer, which contains one cis double bond, possesses a biological activity as provitamin A which is about 38 percent of that of the natural  $\beta$ -carotene. The authors also noted that "the response of vitmin A-deficient rats to  $\beta$ -carotene administered simultaneously with  $\alpha$ -tocopherol is markedly greater than obtained in earlier tests with similar unitage of Reference cod-liver oil given either with or without tocopherol."

II. *All-trans-γ-carotene and pro-γ-carotene*, H. J. Deuel, Jr., C. Johnston, E. Sumner, A. Polgár, W. A. Schroeder, and L. Zechmeister.—The pro- $\gamma$ -carotene employed was isolated from *Pyracantha* berries, the  $\gamma$ -carotene from *Mimulus*, and the prolycopene from Tangerine tomatoes. These products were fed in curative doses to vitamin A-deficient rats. Over a 28-day period, each of the 10 comparable groups of test animals received, in addition to the A-free diet, one of the following supplements daily in 0.1 cc. of Wesson oil containing 0.5 mg.  $\alpha$ -tocopherol: 0.6 or 1.2  $\mu$ g. of  $\beta$ -carotene; 0.6, 1.2, or 2.4  $\mu$ g. of  $\gamma$ -carotene; 0.6, 1.2, 2.4, or 4.8  $\mu$ g. of pro- $\gamma$ -carotene; and 60  $\mu$ g. of prolycopene; and also oil-tocopherol

alone (negative controls). Curves showing weight gain in relation to dosage indicated that the pro- $\gamma$ -carotene was of lower potency than  $\beta$ -carotene, and that the  $\gamma$ -carotene was of still lower potency. As calculated by the method of Coward (E. S. R., 79, p. 710), 2.3  $\mu$ g. pro- $\gamma$ -carotene and 3.6  $\mu$ g. of  $\gamma$ -carotene, respectively, were biologically equivalent to 1.0  $\mu$ g. of  $\beta$ -carotene. Thus the pro- $\gamma$ -carotene ( $C_{40}H_{56}$ ), a naturally occurring stereoisomer of  $\gamma$ -carotene, served as a provitamin A whose biological effect in the rat was 44 percent of that of  $\beta$ -carotene. The  $\gamma$ -carotene (from *Mimulus*) had a potency of only 28 percent of that of  $\beta$ -carotene. The prolycopenone,  $C_{40}H_{56}$ , was inactive even in daily doses of 60  $\mu$ g.

III. *All-trans- $\alpha$ -carotene and neo- $\alpha$ -carotene U*, H. J. Deuel, Jr., E. Sumner, C. Johnston, A. Polgár, and L. Zechmeister.—By means of the assay procedure used above, the vitamin A potencies of all-trans- $\alpha$ -carotene and neo- $\alpha$ -carotene U were determined in comparison with that of  $\beta$ -carotene as a standard of reference. The 28-day weight gains in the groups receiving  $\beta$ -carotene at the 0.6- $\mu$ g. and 1.2- $\mu$ g. levels were 29.5 and 51.6 gm., respectively; these results compared very favorably with the respective gains of 25.0 and 47.9 gm. obtained in the earlier study (II above). In the dosage/gain-in-weight curves, the three points for  $\alpha$ -carotene (established for daily supplements at the 1.2-, 2.4-, and 4.8- $\mu$ g. levels) and the four points for neo- $\alpha$ -carotene U (0.6-, 1.2-, 2.4-, and 4.8- $\mu$ g. levels) fell on straight lines reasonably parallel to the line through the reference value for  $\beta$ -carotene, thus supporting the reliability of the data. The potency of  $\alpha$ -carotene, calculated by the method of Coward, was 53 percent of that for  $\beta$ -carotene, 1.9  $\mu$ g. of the former being equivalent to 1.0  $\mu$ g. of the latter. The A-activity of the neo- $\alpha$ -carotene U (calculated on the group receiving 4.8  $\mu$ g. daily) was only one-fourth that of all-trans- $\alpha$ -carotene, and hence only one-eighth that of all-trans- $\beta$ -carotene. As indicated by the 28-day weight gains produced in A-deficient rats fed curative doses of the carotenes, the  $\alpha$ -,  $\beta$ -, and  $\gamma$ -forms tested in the three studies showed the following relative provitamin A potencies: All-trans- $\beta$ -carotene : neo- $\beta$ -carotene U : all-trans- $\alpha$ -carotene : neo- $\alpha$ -carotene U : all-trans- $\gamma$ -carotene : pro- $\gamma$ -carotene = 100 : 38 : 53 : 13 : 28 : 44.

Vitamin B<sub>1</sub> in unmalted and malted cereals and malt extract, J. G. ORGAN and F. WOKES (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 63 (1944), No. 6, pp. 165-169, illus. 1).—The fluorimetric method of Nicholls et al. (E. S. R., 88, p. 436), which does not include an adsorption step, was applied to the assay of B<sub>1</sub> in cereal products. This method is subject to quenching errors due in part to naturally occurring substances concentrated in the germ and in part to products of heating or digestion, as in malting or brewing processes. Correction for quenching was provided by adding B<sub>1</sub> until it formed at least 80 percent of the total B<sub>1</sub> present. Some, but not all, of the interfering substances could also be removed by isobutanol. Compared with the yeast growth method of Schultz et al. (E. S. R., 88, p. 293), satisfactory results were thus obtained for a variety of foodstuffs exhibiting marked quenching effects. Samples of malt extract, representative of the various methods of preparation encountered commercially, gave values for B<sub>1</sub>—from 3.85 to 9.00  $\mu$ g. per gram. During the preparation of malt extract from malt barley, under normal conditions, an increase of 24 percent in the B<sub>1</sub> content was found in four samples tested.

Further studies on vitamins B<sub>10</sub> and B<sub>11</sub> and their relation to "folic acid" activity, G. M. BRIGGS, JR., T. D. LUCKEY, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 153 (1944), No. 2, pp. 423-434, illus. 1).—Previous experiments from the authors' laboratory (E. S. R., 89, p. 580; 90, p. 821) demonstrated the existence of the water soluble vitamins B<sub>10</sub>, essential for proper feather formation, and B<sub>11</sub>, necessary for chick growth. Further attempts to separate these factors from "folic acid" activity as measured by *Streptococcus*

*lactis* R and *Lactobacillus casei* involved the use of a Super Filtral eluate of solubilized liver. This was subjected to one or more of the following treatments: Dialysis, precipitation by organic salts, washing with organic solvents, and autoclaving with acid or alkali. Various amino acids, purines, and minerals were also tested for  $B_{10}$  or  $B_{11}$  activity, but were ineffective. The liver eluate was found to contain an antianemia fraction, as well as the other fractions mentioned above. The authors conclude that "folic acid" activity has been separated, at least in part, from vitamin  $B_{10}$ ,  $B_{11}$ , and antianemia activity, and does not appear to be necessary per se for the chicks unless in small amounts."

**Observations on the occurrence of "folic acid" in liver and muscle, L. D. WRIGHT, H. R. SKEGGS, and A. D. WELCH (Arch. Biochem., 6 (1945), No. 1, pp. 15-25, illus. 6).**—The influence of various chemical and physical factors upon the folic acid content of rat liver and muscle was studied. Folic acid was assayed by the method of Landy and Dicken (E. S. R., 90, p. 298). With one exception the tissue digestions were carried out in stoppered flasks (to which 1 cc. benzene was added) for 24 hr. at 37° C. The tissues, dispersed by spatula or blending at pH 4.0 or 7.0 and digested with takadiastase and/or xanthopterin, showed the following trends: (1) Higher folic acid values were found when muscle was digested at pH 7.0 in the presence of takadiastase; (2) no greater yield of folic acid was found when rat liver was digested in a buffered solution at pH 4.0 or 7.0 in the presence of takadiastase; and (3) highest values were obtained when a 2-percent takadiastase extraction in water was used. Incubation with varying amounts of neutral salts, or xanthopterin, at various pH levels showed that a moderate concentration of salt increased the folic acid content of rat liver, as did the addition of xanthopterin (in amounts approximately equivalent to 50 times that of the folic acid present). In the presence of xanthopterin the optimum pH was between 7.0 and 8.0. A discussion of the probable chemical reactions causing these variations in folic acid values obtained is given.

"The data obtained are interpreted as indicating that in the liver of the rat folic acid may undergo enzymatic conversion into materials having little or no activity as growth factors for lactic acid organisms. No evidence indicating the disappearance of folic acid during the incubation of rat skeletal muscle could be found."

**Dietary granulocytopenia in rats corrected by crystalline *L. casei* factor ("folic acid"), A. KORNBERG, F. S. DAFT, and W. H. SERRELL (Soc. Expt. Biol. and Med. Proc., 58 (1945), No. 1, pp. 46-48).**—Rats were maintained on one of three purified diets lacking in folic acid. One diet included 1 percent sulfasuxidine. While 20 out of 21 rats developed granulocytopenia on the sulfasuxidine-containing diet, 6 out of 185 rats fed the other purified diets did likewise. Treatment with folic acid (25 $\gamma$  crystalline folic acid for each of 4 days) resulted in a rapid and striking response. Relapses which occurred likewise responded when treatment was renewed. A discussion of the possible factors involved in the cause of granulocytopenia in rats on a purified diet is given. There was an absence of severe anemia in this series of experiments.

**The  $F_2$  excretion of normal men on different levels of niacin intake, O. MICKESEN and L. L. ERICKSON (Univ. Minn.). (Soc. Expt. Biol. and Med. Proc., 58 (1945), No. 1, pp. 33-36).**—Four normal men were maintained on a diet which supplied an average of 12.4 mg. niacin per day, while four other men were given the same diet plus an additional 10 mg. niacin. This was followed by a period of 32 days when the daily niacin intake was reduced to 0.12 mg. Modifications of the original method of Najjar et al. (E. S. R., 88, p. 712) were compared with his recent improved procedure (E. S. R., 93, p. 6) analyzing the urine samples for  $F_2$ . The results of the experiment showed that the original method of Najjar et al. did not differentiate between the two levels of niacin intake used.

Even employing another method of analysis, by Hull and Perlweig (E. S. R., 92, p. 6), the subjects on a severely restricted niacin intake (0.12 mg./day) showed only a slight and inconsistent decrease in urinary F<sub>2</sub>. The authors discuss the possible explanations for their results, which, under the experimental conditions used, did not substantiate the findings of Najjar and Wood (E. S. R., 85, p. 702).

**Studies on the nicotinic acid content of coffee.** L. J. TEPLEY, W. A. KREHL, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Arch. Biochem.*, 6 (1945), No. 1, pp. 139-149, illus. 1).—Microbiological assay of the nicotinic acid content of coffee indicated approximately 9.5 mg. per 100 gm.; coffee beverage gave about 1.0 mg. per cup (175 cc.). Attempts to correlate these results with biological values were made. Chicks showed erratic growth and symptoms of toxicity when a water extract of roasted coffee, corresponding to 0.5 to 1.0 mg. nicotinic acid per 100 gm. of ration, was fed. When a purified (norite adsorbed, pyridine-methanol eluted) extract was used, activity corresponding to one-fifth of that measured microbiologically was obtained. Dogs were fed a basal synthetic ration supplemented with thiamine, riboflavin, pyridoxine, calcium pantothenate, choline, haliver oil, and a folic acid concentrate. The strong emetic effect of the water extract of coffee prevented its use, so the norite eluate was fed by stomach tube in amounts equivalent to the water extract of 140 gm. of roasted coffee, or to 90 or 180 gm. of roasted coffee. The expected response to nicotinic acid occurred only after *p*-aminobenzoic acid, inositol, and biotin were added to the basal ration. Good agreement with microbiological results was then obtained (27.9 v. 28.2 mg.). Dogs placed on the basal ration plus nicotinic acid with added roasted coffee equivalent to 5.0, 7.5, or 10.0 percent of the diet exhibited various abnormal symptoms; addition of inositol cured the paralysis which developed, while biotin relieved the "weepy eye" condition produced. Rats were then fed finely ground roasted coffee in amounts replacing 50, 20, 10, and 5 percent of their basal synthetic ration. At the 10 percent level growth was poor and some cases of alopecia occurred. Crystalline caffeine (0.1 to 0.25 percent) when fed produced similar growth depression and alopecia.

The authors conclude that "it is difficult to theorize as to how important the symptoms we have observed in the chick, dog, and rat may be in the case of the human. Perhaps the most significant fact we have observed is that the amounts of coffee extract which produce growth depression in experimental animals approach amounts consumed by some humans. Beyond this, the toxic effects vary with the species and the possible effect on the human is purely a matter of conjecture. . . . The results we have obtained might be due to effects on the intestinal flora, interference with absorption of nutrients, direct effects in the tissues, or a combination of these factors. Thus it seems apparent that much work is necessary if the exact mechanisms are to become known."

**Studies on the distribution, properties, and isolation of a naturally occurring precursor of nicotinic acid.** W. A. KREHL and F. M. STRONG. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 1-12).—As a result of observations by Andrews et al. that an increase occurred in the apparent nicotinic acid content of wheat products following alkali treatment (E. S. R., 88, p. 732), the authors have attempted to isolate and identify this derivative or "precursor." The present paper describes in detail the chemical procedures used in trying to separate it effectively from nicotinic acid. Several extraction methods, at different pH levels and with various solvents, as well as the effects of dialysis, precipitation, adsorption, and elution, were studied. The evidence for the existence of the precursor and all information regarding its occurrence and properties were based upon the results of microbiological assay before and after alkali treatment. The interpretation of

these results rested on the assumption that *Lactobacillus arabinosus* is completely unable to utilize the intact precursor, and that no substance other than nicotinic acid capable of influencing the bacterial growth is produced by the action of alkali.

The substance in extracts of wheat bran and certain other biological materials which on mild alkali treatment became capable of stimulating the growth of *L. arabinosus* was not readily separated from free nicotinic acid, as judged by microbiological assay or by the various manipulation procedures used. A charcoal adsorbate, carrying 13.5 times as much precursor as nicotinic acid, was prepared, but the precursor could not be eluted from it. Evidence was presented which suggested that the precursor was a derivative of nicotinic acid, consisting of the nicotinyl radical attached to a substituent bearing functional groups which rendered the entire molecule acidic and water-soluble. Methods of extracting and estimating the amount of the precursor in various materials, as well as determining its stability under different conditions, also were studied.

The biological activity of a precursor of nicotinic acid in cereal products, W. A. KREHL, C. A. ELVEHIJEM, and F. M. STRONG. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 13-19).—In continuance of the above study a number of known compounds related to nicotinic acid and several preparations of the "precursor" were assayed by the microbiological method, as well as with dogs and chicks, in an attempt to see if the precursor possessed biological activity as a source of nicotinic acid for higher animals. Microbiological results showed that ethyl (1), propyl (2), and butyl (3) nicotinates after alkali treatment gave approximately 100 percent nicotinic acid values. Nicotinamide glucosidoiodide, the corresponding orthodihydro compound, and nicotinamide nucleoside, on the contrary showed lower activity after alkali treatment. Dog assays with "vitab," nicotinic acid, and various precursor preparations showed good agreement with the microbiological results after alkali treatment. Chick assays gave less clear-cut results, the three esters (1), (2), and (3) showing an activity of 48, 55, and 80 percent in comparison with equimolecular amounts of nicotinic acid. Alkali-treated vitab showed a total activity comparable to that obtained microbiologically, but the initial value before treatment assayed approximately one-half as high in nicotinic acid as by the bacterial test. The authors conclude that "the existence of an alkali-labile precursor of nicotinic acid in certain natural products has been confirmed. It is very probable that the dog can utilize the precursor as a source of nicotinic acid. Several sugar derivatives of nicotinamide do not resemble the precursor in their action on *Lactobacillus arabinosus*. On the other hand, several simple esters of nicotinic acid exhibit a type of biological activity closely similar to that of the precursor."

Biological activity of *N*-methylnicotinamine and nipecotic acid, L. J. TEPLEY, W. A. KREHL, and C. A. ELVEHIJEM. (*Wis. Expt. Sta.*). (*Soc. Expt. Biol. and Med. Proc.*, 58 (1945), No. 2, pp. 169-171, illus. 1).—Dogs on an improved synthetic ration were standardized by producing nicotinic acid deficiency and then fed a suboptimal dose of 25 mg. nicotinic acid. Under these conditions, the dogs responded by an appreciable increase in weight over a 48-hr. period. Doses of *N*-methylnicotinamide chloride (administered orally) when given, instead of nicotinic acid, on an equimolecular basis were ineffective in curing blacktongue or preventing loss of weight. Subsequent administration of 25 mg. nicotinic acid produced a response comparable to the standardized level, indicating no supplementary action due to the *N*-methylnicotinamide chloride. Nipecotic acid (hydrogenated nicotinic acid), previously found by Woolley et al. (*E. S. R.*, 80, p. 569) to be inactive for the dog and the dysentery bacillus, was practically inactive for *Lactobacillus arabinosus*, being one ten-thousandth as active as nicotinic acid.

This slight activity is ascribed to probable impurity. The theory of Najjar et al. (E. S. R., 92, p. 741) as to the relation of chemical structure to anti-blacktongue activity is discussed.

**Factors influencing the riboflavin content of the cornea,** O. A. BESSEY, O. H. LOWRY, and J. LOPEZ (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 635-643, illus. 1).—Studies were made on the effect of visible light, ultraviolet irradiation, and different levels of riboflavin intake upon the riboflavin concentration in the cornea of the rat. The authors' micromethod of riboflavin determination (p. 678) was used. An attempt to estimate the relative proportion of cells in the various parts of the cornea led to the development of a micro-assay for phosphorus based upon the classical method of Fiske and Subbarow. Measuring as little as 0.08γ of P, results showed that the P concentration of the normal corneal epithelium almost exactly paralleled the riboflavin concentration, so that the amount of riboflavin per mole of P is nearly the same in the epithelium as in the rest of the cornea. With a riboflavin deficient diet, corneal riboflavin decreases without an accompanying fall in P. The authors, therefore, infer a real decrease in the riboflavin concentration of the cells whether a basis of dry weight or cell P is used. Data indicated that the cornea promptly reflected changes in dietary riboflavin. Dietary riboflavin amounting to 40γ per day produced maximum results during the experimental period (3 weeks). There was no demonstrable influence of either visible or ultraviolet light upon the concentration of riboflavin in the cornea, although vascular changes were produced.

**Inhibition of utilization of thiamine and diphosphothiamine for growth of micro-organisms,** H. P. SARETT and V. H. CHELDELIN. (Oreg. State Col.). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 91-100).—"Pyrithiamine, the pyridine analogue of thiamine, and 6-aminopyrimidine compounds inhibit the utilization of diphosphothiamine for growth of *Lactobacillus fermentum* more than they inhibit the use of thiamine. The presence of some free thiamine does not overcome this difference in inhibition. The findings with pyrithiamine are the same for growth of *Penicillium digitatum*. Addition of iodoacetate, fluoride, malonate, cyanide, or dinitrophenol inhibits growth or acid production of *L. fermentum*. The effects are the same in the presence of thiamine, monophosphothiamine, or diphosphothiamine. The results indicate that carboxylase formed from thiamine is a more firmly bound enzyme than that formed from added diphosphothiamine, and suggest that thiamine is attached to the apoenzyme before being phosphorylated."

**The riboflavin, niacin, and pantothenic acid content of Oklahoma sorghum sirup,** G. KNOX. (Okla. A. and M. Col.). (*Okla. Acad. Sci. Proc.*, 24 (1944), pp. 95-96).—Seven samples of sorghum sirup produced by the open-pan evaporation method were assayed by microbiological methods. Values (in micrograms per gram) ranged from 0.85 to 1.15 for riboflavin, 6.00 to 12.00 for niacin, and 8.35 to 13.30 for pantothenic acid. The author concludes that although measurable amounts of these three vitamins still remain in sirup prepared by the open-pan procedure, the quantities are not sufficient to give it any significant value as a special vitamin source.

**Some ascorbic acid and moisture determinations on fresh and dehydrated lima beans,** A. H. THOMPSON and C. H. MAHONEY. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 44 (1944), pp. 448-452).—Lima beans of the Early Baby Potato variety were found to contain progressively less ascorbic acid and moisture as their sieve size increased. White lima beans showed the lowest vitamin C value of 9.6 mg. per 100 gm. fresh weight, while green beans ranged from 15.0 to 36.6 mg. In the larger sizes, the sinkers invariably contained less moisture and less ascorbic acid than either the floaters or the nonseparated lots. A high primary drying temperature (190°-200° F.) was not detrimental to retention of ascorbic

acid, but the method of blanching and length of blanch affected the final ascorbic acid content in both water blanching and steam blanching. Increased blanching time reduced the final ascorbic acid content. Greatest loss of ascorbic acid occurred in water blanching. A preblanching treatment consisting of immersion in 0.2 percent sodium sulfate solution had little influence on the ascorbic acid or moisture content of the dehydrated beans. Water blanching resulted in a product with lower moisture content than that obtained by steam blanching. The ascorbic acid content of the dehydrated lima beans (milligrams per gram oven-dry material) averaged about 0.43 in properly dehydrated samples.

**Ascorbic acid content of tomatoes,** I. J. KASKI, G. L. WEBSTER, and E. R. KIRCH. (Univ. Ill.). (*Food Res.*, 9 (1944), No. 5, pp. 386-391, illus. 3).—Three series of the Early Baltimore variety of tomatoes were tested for their ascorbic acid content during various stages of development. Results confirmed earlier observations of Wokes and Organ (E. S. R., 92, p. 744) that no significant differences in ascorbic acid values occurred in green and ripe tomatoes collected at the same time, and that the degree of sunlight and rainfall may be the causal agents for the variations in ascorbic acid content noted.

**Vitamin C content of wild greens,** H. C. MURRAY and R. STRATTON. (Oklahoma Expt. Sta. and A. and M. Col.). (*Jour. Nutr.*, 28 (1944), No. 6, pp. 427-430).—The vitamin C content of 10 varieties of wild greens was measured by the method of Loeffler and Ponting (E. S. R., 89, p. 515). Information as to degree of shade, condition of soil, plowing, and succulence is noted, and the generic as well as common names are listed. The samples were divided into three portions immediately after harvesting. One aliquot was blanched for 1 min. in boiling water, quick frozen, and placed in frozen locker storage for 36 to 65 days. A second aliquot was assayed immediately, and the third aliquot of 50 gm. of greens was cooked for 5 min. in 100 cc. of boiling distilled water, after which the assay was made on the combined greens and cooking water. The authors found that the changes occurring during cooking and freezing were comparable to those found in spinach and other cultivated greens. Heavy losses were observed in the frozen foods and little or no loss (according to the tabulated data) on cooking under the experimental conditions employed. Values for the wild greens in terms of milligrams of ascorbic acid per gram fresh weight were: Curly dock 1.30, prickly lettuce 0.41, povertyweed 0.80, common chickweed 0.26, common dandelion 0.15, red-seeded dandelion 0.11, tall dock 1.34, shepherds-purse 0.67, pokeweed 1.39, and lambquarters 0.66. "There was some indication that the vitamin C content was greater in plants exposed to full sunlight and in fertile, uncultivated soil."

**The destruction of ascorbic acid during the cooking of green vegetables: Observations on the mechanisms involved,** L. H. LAMPITT, D. H. F. CLAYSON, and E. M. BARNES (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 63 (1944), No. 7, pp. 193-198, illus. 1).—"A study has been made of the decomposition of ascorbic acid in aqueous solution at temperatures approaching boiling point in the presence of traces of copper. During the course of this, a mechanism was discovered whereby flocculation of alkaline-earth phosphates, produced by adding phosphate to hard tap water, causes inactivation of the catalytic effect of copper. The heat-lability of this system makes it resemble an enzyme in certain respects. It is shown that during the cooking of green vegetables decomposition of ascorbic acid is limited by the restricted supply of gaseous oxygen available rather than by the inactivation of the various destructive mechanisms. . . . The so-called 'ascorbic acid oxidase' of green vegetables was found to be destroyed rapidly at temperatures of 65° and above. . . . It is suggested that there is some justification for the view that the various destructive mechanisms recognized are all ultimately attributable to ionic copper."

Inhibition of oxidation of ascorbic acid by certain vegetable extracts: Progress report, R. REDER (*Oklahoma Sta. Mimeo. Cir.* 145 (1945), pp. 7+).—Aqueous extracts were prepared by grinding a weighed amount of fresh vegetable in a Waring blender with water and filtering. Either the fresh or the boiled extract, the latter after filtering to remove coagulated proteins and other precipitated material, inhibited the oxidation of ascorbic acid during boiling. In the tests, the extract was diluted so that 1 cc. was equivalent to 0.25 gm. of the fresh vegetable. The inhibition of oxidation produced by an extract was determined by the difference between the amounts of ascorbic acid oxidized during the same boiling period in equal volumes (40 cc.) of control and experimental reaction mixtures which differed only in that the experimental mixture contained a known volume of the extract. At the end of the boiling period, the volume of the reaction mixture having been kept constant by addition of hot water, 40 cc. of 6 percent metaphosphoric acid was added to the mixture, the solution quickly cooled, and its ascorbic acid content determined by titration.

Tests with extracts of lettuce, cabbage, and cauliflower is buffered (pH 5.7) and unbuffered (pH 4.5-5.5) solutions showed that the length of the boiling period (5, 10, 15 min.) had no effect on the percentage inhibition produced by different extracts, but that extracts of cabbage and cauliflower effected a much greater inhibition than lettuce extract; with ascorbic acid at the 2-mg. level in the buffer reaction mixture, the percentage inhibition after 15 min. boiling was 76, 79, and 44 percent for these three extracts, respectively. Tests with buffered solutions containing 2 cc. of extract of lettuce, cabbage, or cauliflower and from 1 to 8 mg. of ascorbic acid showed that the percentage inhibition with 15 min. boiling decreased with increasing amounts of ascorbic acid; the respective inhibitions at the 1-mg. level were 50, 79, and 92 percent as compared with 16, 54, and 72 percent at the 8-mg. level. Increasing the amount of extract in reaction mixtures containing a fixed amount of ascorbic acid produced increasing inhibition up to a certain maximum, beyond which point larger amounts of certain extracts produced decreased inhibition. From 2 to 4 cc. of extract were required to produce maximum inhibition (86-47 percent) in tests with Brussels sprouts, green beans, squash, potatoes, broccoli, cauliflower, cabbage, spinach, sweetpotatoes, and lettuce. The percentage inhibition produced by increasing amounts of lettuce, cabbage, and cauliflower extracts in unbuffered (pH 4.6-6.2) and buffered (pH 5.7) solutions indicated that the inhibitory effect was influenced by the pH of the reaction mixture but was not the result of a pH unfavorable to the oxidation of ascorbic acid. In reaction mixtures containing fixed amounts of ascorbic acid and added copper, the inhibition produced by increasing amounts of the extract increased until a maximum was reached, then remained constant; the maximal inhibition obtained was found to vary with the level of added copper.

The practical aspect of these findings in relation to losses of ascorbic acid in cooking is discussed. It is pointed out, for example, that frozen Brussels sprouts, fresh cabbage, and fresh broccoli, all of which yielded extracts with high inhibitory potency, lost with 6-8 min. of steaming only 10 to 16 percent of their ascorbic acid, whereas spinach, which yielded a low-potency extract, lost 50 percent.

The effects of storage upon the ascorbic acid content of some West Virginia apples, V. B. FISH. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 73-78).—Ascorbic acid was determined by the titration technic reported by Clegg and Satterfield (E. S. R., 84, p. 283) and the electrometric method of Harris et al. (E. S. R., 89, p. 626). Six varieties were analyzed as soon as received in September and October 1942, and after 2 and 4 months' storage at 0° to 2° C. Tests were made on both cored apples and peeled apples. Preparation of the samples included weighing, transfer to a glass mortar containing a solution

of 8 percent acetic acid and 4 percent metaphosphoric acid, then grinding with acid-washed sand. Results showed ascorbic acid values ranging between 1.7 and 4.5 mg. per 100 gm. of apple tissue, including the peel. Samples of coreless apple tissue showed 12 to 1.9 times as much ascorbic acid as similar samples without the peel. "In general there was a considerable loss of ascorbic acid during the first 2 mo. of storage at 0° to 2°. The average loss during this period amounted to 25.7 percent of the total ascorbic acid present when received." Experiments undertaken to determine the rapidity with which ascorbic acid in apple tissue was oxidized when exposed to air indicated rapid loss of ascorbic acid, amounting to over 50 percent of the original value after only 2 minutes' exposure of the ground tissue.

The ascorbic acid content of several varieties of apples grown in West Virginia, V. B. FISH, R. B. DUSTMAN, and R. S. MARSH. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 44 (1944), pp. 196-200, illus. 1).—As the experiments noted above had been carried out on commercial varieties, analyzed a considerable time after the apples had been picked, and had given results unexpectedly low in ascorbic acid, the present study was undertaken with apples of known history and degree of maturity. Samples were analyzed shortly after picking. Highly colored extracts were assayed for ascorbic acid by the xylene method of Stotz (E. S. R., 88, p. 153). All samples were comminuted and extracted in a Waring Blender with 3 percent metaphosphoric acid. Thirteen varieties, picked at approximately the same state of maturity, gave values which ranged from 15 to 20 mg. percent for Duchess and Red Duchess; 10-15 mg. percent for Golden Delicious, Jonathan, Stayman Winesap, and Grimes Golden; and 7-10 mg. percent for McIntosh, Maiden Blush, Wagener, Wealthy, York Imperial, Melba, and Rome Beauty.

Storage at 3° C. for 30 days gave losses in ascorbic acid which approximated 50 percent. Greater losses occurred at 20°. The rate of loss varied with different varieties. Fruit allowed to remain on the tree (Wealthy and McIntosh varieties only tested) continued to gain slightly in ascorbic acid content for as long as 42 days after normal picking time.

## HOME MANAGEMENT AND EQUIPMENT

Management in homes, E. M. CUSHMAN (*New York: Macmillan Co., 1945, pp. 285+, illus. 230*).—This book, dealing with actual homes operated at moderate or low income levels, tells the stories of obstacles and achievements in the making and the improvement of these homes. It presents a record of the varied ways in which the families managed in getting the kind of homes they wanted. The book offers no formulated rules for home management, presents no factual matter, and gives no bibliography; rather, it teaches by actual examples of home management applied in real homes. Questions and topics for discussion are suggested as a stimulus to further questioning and investigation.

Performance studies on home dehydrators, W. B. ESSELEN, JR., S. G. DAVIS, and M. A. EWING. (Mass. Expt. Sta.). (*Food Res.*, 9 (1944), No. 5, pp. 341-347, illus. 3).—A procedure is outlined which permits the evaluation of the efficiency of home dehydrators. The relative operating efficiency (r. o. e.) of the dehydrator can be calculated as follows:

$$\frac{\text{Pounds water evaporated} \times 1,000 \text{ B. t. u.}}{\text{Kilowatt-hours electrically used} \times 3,412} \times 100.$$

The performance of the dehydrator is considered in relation to (1) the rate of drying and the drying time, (2) uniformity of air flow and temperature, (3) performance of the thermostat, (4) operating efficiency, and (5) quality of the finished

product. Three types of dehydrators were studied—(1) forced draft, (2) natural draft, and (3) oven type. The r. o. e. was found to be a reliable index of the over-all performance of the dehydrator, and values of 40 percent or greater usually indicated a satisfactory dehydrator under the test conditions outlined. The authors found that the forced draft type of good design was most satisfactory, as the trays did not need to be rotated and the drying time was shortest of the three methods used. Natural draft dehydrators if properly designed also yielded good results, but the drying time was prolonged, temperature control required watching, and trays had to be rotated at 1- or 2-hr. intervals. Oven drying proved least satisfactory, because of the difficulty of controlling the temperature, variations of temperature in different parts of the oven, and the necessity of frequently shifting and rotating the trays.

## REPORTS AND PROCEEDINGS

Fifty-seventh Annual Report, Colorado Agricultural Experiment Station, 1943-44, H. J. HENNEY. (Partly coop. U. S. D. A.). (*Colorado Sta. Rpt. 1944*, pp. 44, illus. 1).—Findings are reported from the work in animal pathology, including that with over-eating in feedlot lambs, drenching feeder lambs to combat ringed tapeworms, mites suspected of being intermediate hosts for these tapeworms, applying the pullorum test to turkeys, distemper in foxes and minks, and other fox diseases; plant pathology, including work with peach mosaic, tomato fruit rot, potato ring rot, and root rot of peas and sugar beets; chemistry, including mineral analyses of irrigation and well waters, and of nutrients in meadow grasses and native forage plants; entomology, including the control of the cherry leaf roller, bean beetles and cutworms, substitute insecticides, and control of potato psyllids and flea beetles; home economics, including transmission of egg quality and cake mixtures for high altitudes; horticulture, including the effects of soil treatments on the skin color and quality of potatoes, bacterial wilt of potatoes, variety tests of peaches and tomatoes, disease-resistant potatoes, and vegetable storage requirements; poultry, including vitamin yield of sprouted grains, soybean oil meal as a source of supplementary protein, beet seed as a litter material and feed, and types of poultry houses; range and pasture management, including grazing studies and range improvement; and engineering, including irrigation measurements and potato storage (noted on p. 781).

Report of the director [of the New Haven Station] for the year ending October 31, 1944, W. L. SLATE (*Connecticut [New Haven] Sta. Bul. 484 (1945)*, pp. 55-103+, illus. 1).—In addition to several articles noted elsewhere in this issue, progress reports are given in entomology, including studies of the Japanese beetle, DDT and other insecticides and dusts, control of the European corn borer, codling moth, gypsy moth, Dutch elm disease, and rodents, wireworms, parasites of fruit pests, and the dogwood and peach tree borers; plant pathology and botany, including Dutch elm disease and *Vorticillium* wilt of elm, fungicide research, chemotherapeutic inactivation of X disease of peach, spray coverage on apples, and investigations of root diseases; genetics, including studies with corn, squash, peppers, and tomatoes, and of genetic principles; soils, including plant tissue tests, vegetable crop rotations, effect of soil reaction on green manure crops, and feeding habits of tree roots; forestry, including strength tests of plantation v. natural stands of conifers, and white pine blister-rust control; and the Tobacco Substation, including work with a calico-resistant broadleaf type and shade strains, irrigation of tobacco, ammonium nitrate as a source of nitrogen, possible role of boron, plowless culture, tobacco pigments, and sterilization of seed beds with chloropicrin and control of damping-off.

**Farm science in war and peace: The Sixty-fifth Annual Report of the New Jersey State Agricultural Experiment Station and the Fifty-seventh Annual Report of the New Jersey Agricultural College Experiment Station, 1943-44,** W. H. MARTIN (*New Jersey Sta. Rpt.* 1944, pp. 64, illus. 15).—In addition to items noted elsewhere in this issue and administrative data, this report notes progress on research on soils, including erosion control, tests of organic materials, synthetic manure, vitamins in composted materials, potassium and boron needs, the role of sand-size soil particles, and water applications of fertilizers; plant breeding, including studies with asparagus, sweet corn, alfalfa, and corn (for borer resistance); variety tests of peaches (for hardiness), Sudan grass, oats, and barley; cultural practices, including spacing of soybeans, irrigation of potatoes, timothy hay, fertilizers and cutting time, grass-legume mixtures for hay, new grasses for midsummer pasture and hay, early planting of spring oats, sweetpotato storage, greenhouse tomato culture, oats as a cover crop for blueberries, effect of light intensity on yield of roses and carnations, and rooting of geraniums; pest control, including work with the potato tuber worm (*Gnorimoschema operculella* (Zell.)), the wheathead armyworm (*Protoleucania albilinea* (Hbn.)), codling moth, protection of newly set tomato plants, pea aphid, oriental fruit moth, spray coverage of apple trees, arsenical injury to fruit trees, blueberry stunt and weevil, and ways to save copper in sprays; livestock, including breeding studies with dairy cattle, inheritance of mastitis resistance, vaccination for Bang's disease, and preserving alfalfa silage with corn meal; poultry, including the Legbar breed, Jersey Buff turkeys, parasites and diseases, wartime poultry feeding, vitamin A needs, crowding of layers, flock mating, and culling practices; other livestock, including extra lamb production, thyroprotein compounds for increasing the milk production of beef cows, and oyster culture; freezing nectarines, blueberries, and blackberries, and maturity of peaches for canning; mosquito control; sewage purification; isolation of antibiotic compounds; bacterial corrosion of iron; and production of fat from yeast.

**Fifty-seventh Annual Report [of Rhode Island Station, 1944],** M. H. CAMPBELL (*Rhode Island Sta. Rpt.* [1944], pp. 39, illus. 2).—In addition to meteorological data and administrative material, this report notes progress on projects dealing with fruits, including the control of soil erosion by contour planting and alternate sod and cultivation, a new box construction which reduces water loss in apples, lauryl isoquinolinium as an apple scab fungicide, and prestorage treatment of apples with CO<sub>2</sub> to reduce scald; fungicides, including their preparation from waste tobacco; field crops, including fertilizer placement, ratios for silage corn, importance of soil types, grasses for pastures and airports, turf fertilization, destruction of weed seeds in seed beds, and turf fungicides; home economics, including injury to floor finishes by wartime shoos, and quick freezing for quality foods; poultry rations and diseases, including infectious bronchitis, infectious coryza, pigeon respiratory disease, blue comb disease of turkeys, starfish meal in chick rations, and dried yeast as a supplementary poultry feed; potatoes, including effect of pH and available Ca on yield and scab, variety tests, insecticides for preventing injury to potato foliage, and nitrogen for rye cover crops; rural economics, including wartime milk distribution, estimated food production by Rhode Island farms, and the Newport city milk market; vegetables, including cover crops, fertilizer ratios for tomatoes and peppers, onion yields following grass, variation in vitamin content of vegetable varieties, variety tests with beans, beets, carrots, sweet corn, and peppers, and value of disease-free bean seed.

## MISCELLANEOUS

Bimonthly Bulletin [May-June 1945] (*North Dakota Sta. Bu. Bul.*, 7 (1945), No. 5, pp. 28+, illus. 5).—In addition to articles noted elsewhere in this issue, this number contains M. A. Carleton, Pioneer Durum Wheat Scientist, by C. S. Smith (pp. 3-7) (coop. U. S. D. A.); and North Dakota Farm Prices, by P. V. Hemphill (pp. 27-28).

Abstracts of Bulletins No. 625-662, Circulars No. 101-105, and other publications during 1943 and 1944, A. D. JACKSON (*Texas Sta. Circ.* 107 (1944), pp. 81).—In addition to publications noted previously or elsewhere in this issue, abstracts are included for the following: "A Malformation in Deer," by H. L. Van Volkenberg and W. P. Taylor (p. 30); The Senecio on the Coastal Dunes of Texas, by V. L. Cory (p. 33); New Genera of North American Muscoid Diptera, by H. J. Reinhard (p. 35); The Genus *Styrax* in Central and Western Texas, by V. L. Cory (p. 37); The Effect of Storage of Grains on Their Nutritive Value, by D. B. Jones, G. S. Fraps, B. H. Thomas, and L. Zeleny (p. 39); Microbiological Determination of Amino Acids, by K. A. Kuiken, W. H. Norman, C. M. Lyman, and F. Hale (p. 42); Riboflavin in the Nutrition of the Horse, by P. B. Pearson, M. K. Sheybani, and H. Schmidt (p. 42); The Type and Amount of Receipts Collected by Each State Department in Texas, 1940, by H. C. Bradshaw (p. 42); Low Light Intensity and Cotton Boll-Shedding, by A. A. Dunlap (p. 43); The Soil Resources of Texas, by W. T. Carter (p. 45); Relative Cost of Energy, Protein, Vitamin C, and Carotene in Human Foods, by G. S. Fraps (p. 52); Standardization of Milk of High Fat Content for the Manufacture of American Cheese, by W. S. Arbuckle (p. 54); Variation in Losses Among Bees as a Result of Cotton Poisoning, by F. L. Thomas, W. C. O'Neal, and C. J. Burgin (p. 54); Loco Weed Poisoning Bees, by A. R. Davis (p. 54); and Losses Among Bees in the El Paso Valley and the Probable Causes, by F. L. Thomas (p. 54).

## NOTES

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**Tuskegee Institute.**—The latest report of the General Education Board announces its appropriation of \$495,000 to enable the institute to improve its facilities for instruction in home economics, rural education, and veterinary medicine, and to make additions to its library. This allotment will supplement State appropriations (E. S. R., 89, p. 511) and other funds and will be utilized chiefly for new buildings and equipment. Of the entire fund, \$325,000 will be available for the erection and equipment of what is said to be the first school of veterinary medicine for Negroes in this country.

**Connecticut University and Storrs Station.**—W. B. Young, acting dean of agriculture, has been appointed dean of the College of Agriculture and director of the station. W. L. Slate will again become vice director.

**Connecticut [New Haven] Station.**—Dr. E. Monroe Bailey, associated with the chemical work of the Station since 1902, chief of the analytical chemistry department since 1917, and a nationally recognized authority on food and drug standards, retired October 1. Dr. Harry J. Fisher, associate chemist, has been appointed acting head of the department.

**Florida University.**—The General Education Board has made a grant of \$5,000 per year for 3 years to assist the department of agricultural economics in retaining personnel for research and to conduct statistical and field work.

Dr. Nathan W. Sanborn, associated with the poultry work from 1908 until his retirement in 1935, died in Gainesville on July 8 at the age of 86 years.

**Hawaii Pineapple Research Institute.**—Director E. C. Auchter has also been appointed president of the institute.

**Idaho Station.**—L. C. Erickson has been appointed associate agronomist to carry on weed research work under the alumni research fund provided by the last legislature.

**Illinois University and Station.**—Dr. B. W. Fairbanks has resigned as chief in swine husbandry and accepted a position as head of the division of scientific development of the American Dry Milk Institute, Inc.

**Purdue University and Station.**—F. E. Schnetzler has resigned as associate professor and assistant chief in poultry husbandry to become director of animal breeding research with the DeKalb Breeding Association at DeKalb, Ill., vice Dr. J. Holmes Martin, who returned to the university on August 1 following a year's leave of absence.

**Kentucky University and Station.**—Plans have been approved for remodeling the old veterinary science building for use as an abattoir for an expanded program of teaching and research in meats. Dr. Herbert O. Patton has resigned as assistant veterinarian.

**Maine University and Station.**—Dr. Alfred O. Shaw has been appointed head of the department of animal industry vice Dr. J. M. Cairns, resigned to accept a position as head of the dairy husbandry department in the Maryland University and Station.

**New York State Station.**—R. C. Collison, professor of horticulture, has retired as of September 1. Harold G. Beattie has resigned as assistant professor in food science and technology to engage in commercial work. Dr. C. L. Hamner, as-

sistant professor of pomology, has accepted a position as assistant professor in horticulture in the Michigan College, effective October 15, and Dr. Robert O. Magie, assistant professor of plant pathology, a position with the department of botany and plant pathology in the Florida Station.

**Oklahoma College.**—Passage of an act by the legislature authorizing an expansion of research activities has been followed by the establishment of a Research Foundation, the purpose of which is to coordinate research at the institution and support research in fields lacking formal research projects. The work is under the direction of Dr. K. Starr Chester, director of research; Dr. Otto M. Smith, director of negotiation; and Schiller Scroggs, director of administration. The present program includes projects in chemistry, veterinary medicine, and wildlife conservation.

**Texas College and Station.**—George Washington Curtis, second director of the station, died in Oklahoma City, Okla., on September 18 in his eighty-fifth year. A native of Iowa, he was a graduate of the Iowa College and received the M. S. A. degree in 1887. He came to Texas in 1883 as professor of agriculture and was made agriculturist of the station on its establishment in 1888. In 1890 he also became director, serving in this capacity until 1893. He was an early farmers' institute worker, the author of Bulletins 1 to 4 of the college, published from 1882 to 1887, and of one of the earliest textbooks in animal husbandry—*Horses, Cattle, Sheep, and Swine*—first issued in 1888.

**Virginia College and Station.**—A grant of \$13,200 has been made by the General Education Board to the institute for the provision of additional personnel in statistical work over a 2-year period.

Dr. E. L. Overholser, chairman of the division of horticulture at the Washington College and Station, has been appointed head of the station department of horticulture as of September 15. C. M. Kincaid has been appointed associate animal husbandman, and R. E. Mather assistant dairy husbandman. H. C. Porter, assistant agronomist, who has been on military leave, assumed his former duties on August 1.

**Washington College and Station.**—Dr. Louis R. Bryant, professor of horticulture and horticulturist in the Colorado College and Station, has been appointed professor of horticulture and assistant horticulturist. Dr. George W. Fischer, pathologist, U. S. D. A. Bureau of Plant Industry, Soils and Agricultural Engineering, has been appointed chairman of the department of plant pathology, vice Dr. E. J. Anderson, resigned to return to his former position as plant pathologist in the Hawaii Pineapple Research Institute.

**West Virginia Station.**—A comprehensive study has been started with the objective of increasing the income of several thousand hill farmers. Experiments included the production and marketing of holly, native nuts and nut meats, wild fruits, maple sugar, and similar products. The project is being financed by a grant from the Sears Roebuck Foundation.

**Wisconsin University and Station.**—Dr. I. L. Baldwin has been appointed dean of the college of agriculture, director of the station, and director of the agricultural extension service; V. E. Kivlin, associate dean of the college of agriculture; and Dr. Esmond E. Snell, associate professor of biochemistry.

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